



ANNUAL REPORT 2011 - 2012



Indian National Centre for Ocean Information Services

(An Autonomous Body under the Ministry of Earth Sciences, Government of India)

'Ocean Valley', Hyderabad - 500 090, India.

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1. Director's Report



It gives me great pleasure to present the progress of Indian National Centre for Ocean Information Services (INCOIS) during 2011-12. The Centre has been consistently striving to provide wide range of ocean information and advisories to users at all levels. The user community that use information and advisory services from INCOIS include fishermen, coastal population, disaster

management authorities at national and state level, national tsunami warning centres in the Indian Ocean countries, shipping industry, port and harbours, offshore oil and gas companies, Indian Navy, Coast Guard, researchers and students.

It was an important year for INCOIS on tsunami warning front. UNESCO designated the Indian Tsunami Early Warning System as a Regional Tsunami Service Provider (RTSP) for the Indian Ocean. INCOIS could successfully handle this new responsibility of providing tsunami warning services to Indian Ocean rim countries simultaneously while acting as the National Tsunami Warning Centre (NTWC) for India with great care and diligence. The centre could detect and report all 64 earthquakes in the Indian Ocean within 6 minutes of their occurrence and issue the tsunami bulletins for 5 major events ($M > 6.5$) as required.

We could increase the frequency of issuing Potential Fishing Zone (PFZ) advisories from thrice a week to daily and partially resolve the difficulty in the generation of advisories on cloudy days through the use of data from multi-satellites (Oceansat-2, MODIS, METOP, NOAA-18 & 19) and using analysed SST fields (GHRSSST). The establishment of the ground station to receive data from Oceansat-2 satellite helped in providing PFZ advisories before 4:00 PM on same day. The ocean state forecasts (waves, tides, surface currents, SST, mixed layer depth, depth of thermocline) were issued on a daily basis as before. The special bulletins on 'High Wave Alerts' issued in Tamil during cyclone Thane (25-29 December 2012) proved to be highly beneficial for the fishermen and civilian authorities in Puducherry.

The dissemination system, for giving information on PFZ advisories and ocean state forecasts, was expanded through the installation of additional Electronic Display Boards (EDB), deploying web sites in local languages (in Malayalam for Southern Kerala and in Tamil for Nagapattinam, Puducherry and Tiruvarur) and through specialised mobile applications. From the information available from various dissemination modes, we conclude that about 97000 fishermen have used the PFZ advisories and ocean state forecasts regularly during 2011-2012.

The ocean observing network was enhanced through the deployments of Argo floats, wave rider buoys, shipboard AWS, tide gauges, tsunami buoys and a mooring in the central Bay of Bengal with a suite of sensors. The analysis of data from the observing systems resulted in several research papers.

While continuing to improve on the ocean models - Hycom, ROMS, Wave Watch-III, SWAN, we could operationally provide the reanalysed subsurface temperature on a monthly basis to IITM, Pune to use it as the initial condition for the atmospheric model used to develop the seasonal prediction of Indian monsoon.

A new initiative, launched in collaboration with CMFRI, FSI and CMLRE, is expected to improve our understanding on the environmental preference of Tuna and their migration paths. The project will concentrate on tagging the Tuna with Pop-up Satellite Archival Tags (PSAT).

On infrastructure front, established the ground station to receive the Ocean Colour Monitor data from Oceansat-2 satellite, installed a 9 meter antenna INSAT hub station to receive the seismic and GPS data from 90 field stations in real time and established the high speed MPLS links connecting regional seismic data centres at NGRI, Hyderabad; NEIST, Jorhat; Survey of India, Dehradun; Institute of Seismological Research, Gandhi Nagar. Improvements in the connectivity through NKN network and enhancement of the band widths of existing ILLS from two service providers, addition of 20 blade servers at tsunami warning centre, etc. are also notable. The construction activities undertaken under the Phase-II expansion of campus is progressing, though with some backlogs.

Our communication engineers succeeded in integrating the INSAT UHF transmitter with drifting and wave rider buoys. This will not only enhance the data reception in real time, but also will cut the costs on data telemetry drastically.

While we continued to provide the ocean information, warnings and advisories, our scientists have also published 21 research papers in peer-reviewed journals with a cumulative Impact Factor (IF) of 24.32.

To promote the use of Hindi in INCOIS, we have celebrated the Hindi Pakhwara in September 2011, conducted competitions in Hindi and organised seminars and symposia in Hindi.

With the addition of 9 scientists at C and B levels, the strength of scientists in INCOIS increased to 62. During the year, 9 project scientists and 10 project assistants were recruited to execute the mission mode projects. 11 project scientists and 3 project assistants resigned during past year.

On the international scenario, INCOIS continued the lead role in Indian Ocean Global Ocean Observing System (IOGOOS), Regional Co-ordination of Argo Programme, Partnership for Observation of Global Ocean (POGO), Regional Integrated Multi-hazard Early warning System (RIMES) and at Intergovernmental Coordination Group (ICG) of Indian Ocean Tsunami and other hazards Warning System (IOTWS) of Intergovernmental Oceanographic Commission (IOC)/UNESCO. The secretariats of IOGOOS and Sustained Indian Ocean Biogeochemistry and Ecosystem Research (SIBER) continued to function from INCOIS. Being the contribution of Government of India to IOC, a special data centre for Ocean Bio-Informatics System (OBIS) is being set up at INCOIS in close coordination with IODE/IOC.

Notable awards and recognitions received by INCOIS scientists include National Geoscience Award, Dr. H.N. Siddiqui Memorial Lecture, Ministry of Earth Sciences (MoES) Certificate of Merit and the First Prize at Annual Scientific Hindi Seminar organised by MoES.

I confidently look forward to INCOIS continuing to provide quality services to society on ocean information and advisories and designing useful products that would transform the operational oceanography in the world. I thank my colleagues at INCOIS for their dedication, commitment and co-operation in designing and executing the projects. All those achievements reported above are nothing but theirs. I take this opportunity to thank Dr. Shailesh Nayak, Chairman, Governing Council and members of GC for their support and guidance at every moment. I would also like to thank Chairmen and members of Finance Committee and Research Advisory Council. I am also thankful to the colleagues at Ministry of Earth Sciences for their strong support and guidance in administration and implementation of projects. The editorial committee chaired by Sudheer Joseph and TVS Udaya Bhasakar, M. Nagaraja Kumar, K. Annapurnaiah, M.S. Girishkumar, R. Harikumar and Archana Singh as members compiled the report based on the inputs from other colleagues. I am extremely grateful to them as well as to my colleagues at INCOIS.

S.S.C. Sheno

2. Our Organization

The Indian National Centre for Ocean Information Services (INCOIS) is an autonomous body under the Ministry of Earth Sciences (MoES), Government of India, registered as a Society under the Andhra Pradesh (Telangana Area) Public Societies Registration Act 1350, Fasli at Hyderabad on 3 February, 1999. The affairs of the Society are managed, administered, directed and controlled, subject to the Bye-laws of the Society, by the Governing Council.

INCOIS Society

1. Secretary, Ministry of Earth Sciences	President
2. Director, National Remote Sensing Centre	Vice-President
3. Joint Secretary, Ministry of Earth Sciences	Member
4. Advisor, Ministry of Earth Sciences	Member
5. Director, National Institute of Oceanography	Member
6. Director, National Institute of Ocean Technology	Member
7. Director, National Centre for Antarctic and Ocean Research	Member
8. Director, Indian National Centre for Ocean Information Services	General Secretary

INCOIS Governing Council

1. Secretary, Ministry of Earth Sciences	Chairman
2. Dr. Harsh Gupta, Hon'ble Member, NDMA, New Delhi	Vice-Chairman
3. Director, National Remote Sensing Centre	Member
4. Director General, India Meteorological Department	Member
5. Financial Adviser, Ministry of Earth Sciences	Member
6. Chairman, Research Advisory Council, INCOIS	Member
7. Additional/Joint Secretary, Ministry of Earth Sciences	Member
8. Director, National Centre for Antarctica and Ocean Research	Member
9. Director, National Institute of Oceanography	Member
10. Director, National Institute of Ocean Technology	Member
11. Principal Advisor (S & T), Planning Commission	Member
12. Director, Space Application Centre	Member
13. Director, Indian National Centre for Ocean Information Services	Member Secretary
14. Programme Officer, Ministry of Earth Sciences	Permanent Invitee

INCOIS Research Advisory Committee

- | | |
|---|------------------|
| 1. Dr. B.N. Goswami, Director,
Indian Institute of Tropical Meteorology | Chairman |
| 2. Dr. (Mrs). P. Venkatachalam, Principal Research Scientist,
Indian Institute of Technology, Mumbai | Member |
| 3. Dr. V. K. Dadhwal, Director, National Remote Sensing Centre,
Hyderabad | Member |
| 4. Dr. M. Dileep Kumar, Scientist -G, National Institute
of Oceanography, Goa | Member |
| 5. Dr. B. K. Saha, Adjunct Professor,
School of Oceanographic Studies, Jadavpur University, Kolkata | Member |
| 6. Dr. M. Ravichandran, Head MOG, Indian National Centre
for Ocean Information Services, Hyderabad | Member secretary |

INCOIS Finance Committee

- | | |
|--|------------------|
| 1. Special Secretary & Financial Adviser, MoES | Chairman |
| 2. Additional Joint Secretary, MoES | Member |
| 3. Director, INCOIS | Member |
| 4. Director/Deputy Secretary (Finance), MoES | Member |
| 5. Programme Officer, MoES | Member |
| 6. Sri. E. Pattabhi Ramarao, Scientist, INCOIS | Member Secretary |

3. The Mission

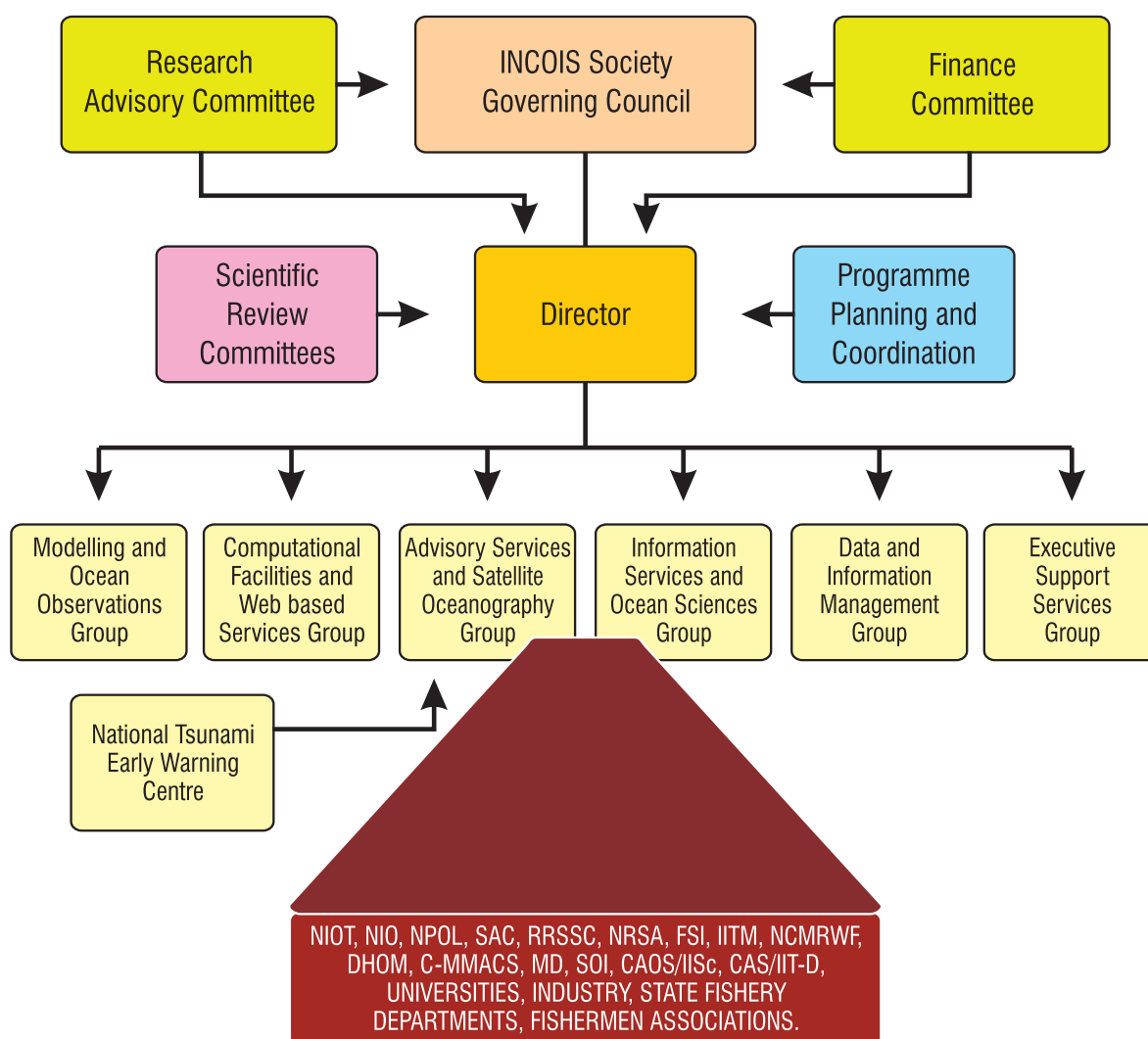
To provide ocean data, information and advisory services to society, industry, government and scientific community through sustained ocean observations, and constant improvements through systematic and focused research in information management and ocean modelling.

The major objectives of INCOIS are:

1. To establish, maintain and manage the systems for data acquisition, analysis, interpretation and archival for Ocean Information and Services.
2. To undertake, aid, promote, guide and co-ordinate research in the field of ocean information and services including satellite oceanography.
3. To carry out surveys and acquire information using satellite technology, ships, buoys, boats or any other platforms to generate information on fisheries, minerals, oil, biology, hydrology, bathymetry, geology, meteorology, coastal zone management and associated resources.
4. To generate and provide data along with value added data products to user communities.
5. To cooperate and collaborate with other national and international institutions in the field of ocean remote sensing, oceanography, atmospheric sciences/meteorology and coastal zone management.
6. To establish Early Warning System for Tsunami and Storm Surges.
7. To support the research centres to conduct investigations in specified areas related to oceanic processes, ocean atmospheric interaction, coastal zone information, data synthesis, data analysis and data collection.
8. To organise training, seminars and symposia to advance study and research related to oceanography and technology.
9. To publish and disseminate information, results of research, data products, maps and digital information through all technologically possible methods to users for promoting research and to meet the societal needs in improving their living standards.
10. To provide consultancy services in the fields of ocean information and services.
11. To co-ordinate with the space agencies to ensure continuity, consistency and to obtain state-of-the-art ocean data from satellite observations.
12. To encourage and support governmental and non-governmental agencies/organizations for furthering programmes in the generation and dissemination of ocean information.

13. To undertake other lawful activities as may be necessary, incidental or conducive to the attainment and furtherance of all or any of the above objectives of INCOIS.

INCOIS, in its pursuit for organizational excellence, national relevance and international significance, translates the scientific knowledge into useful products and services through synergy and knowledge networking with centres of excellence in ocean sciences, atmospheric sciences, space applications, and information and communication technology.



INCOIS Organogram

4. Highlights

Ocean Information and Advisory Services: The difficulty in issuing the Potential Fishing Zone (PFZ) advisories during cloudy days has been resolved partially through the use of data from multi-satellites (Oceansat-2, MODIS, METOP, NOAA-18 & 19) and using analysed SST fields (GHRSSST). This helped in increasing the advisories by 17%. Also, since November 2011, the frequency of issuing the advisories has been increased to daily from thrice a week earlier. During the year, INCOIS issued, 206 PFZ advisories for 14 sectors covering the coastlines of Indian mainland and islands.

While continuing to issue the ocean state forecasts (waves, tides, surface currents, SST, mixed layer depth and depth of thermocline) on a daily basis, INCOIS continued to issue the special bulletins on 'High Wave Alerts' in local languages for the immediate benefit of coastal population and fishing community. The 'High Wave Alerts' issued during cyclone Thane (25-29 December 2012) proved to be highly beneficial for the fishermen and civilian authorities in Puducherry.

The Coral Bleaching Alert System put out the bi-weekly products on 'Hot Spot (HS)' and 'Degree of Heating Weeks (DHW)' for the coral reefs in Andaman, Nicobar, Gulf of Kutch, Gulf of Mannar and Lakshadweep Islands. No serious bleaching events were reported during 2011-12.

Tsunami Early Warnings: UNESCO designated Indian Tsunami Early Warning Centre (ITEWC) at INCOIS and the tsunami warning centres of Australia and Indonesia as Regional Tsunami Services Provider (RTSP) for the entire Indian Ocean region.

On 12 October 2012, INCOIS coordinated the IOWave11 exercise in India with NDMA, MHA, state disaster management authorities, Indian Navy, Coast Guard, major ports and nuclear installations along the coast and disseminated tsunami warnings to designated contacts all over India and 23 countries along Indian Ocean rim. Globally, the IOWave 11 was coordinated by IOTWS/ICG of which INCOIS is a crucial member and contributor.

The ITEWC detected and reported 64 earthquakes during 2011 – 2012 within 6 minutes; mostly within 4-5 minutes. Out of the 64 earthquake events, the centre issued tsunami advisories for 5 major earthquakes occurred in the Indian Ocean. For all events, except for the event that occurred off Northern Sumatra (M7.3) on 11 January 2012 at 00:07 (IST), the centre issued 'No Threat' for India. On that occasion, 'Tsunami Watch' was issued for Indira Point in Andaman and Nicobar Islands; but cancelled within 90 minutes after confirming 'the no change in sea level' from the tide gauges.

Dissemination Systems: The dissemination system was expanded through the installation of Electronic Display Boards (EDB), web sites in local languages (in Malayalam for Southern Kerala and in Tamil for Nagapattinam, Puducherry and Tiruvarur) and mobile applications like Fisher Friend Mobile Application (FFMA), mKRISHI, etc. All India Radio, Karwar and Radio Benziger, Kollam, Kerala came forward to issue periodic news bulletin on ocean state forecasts.

During the year, INCOIS worked closely with NGOs like M.S.Swaminathan Research Foundation, Chennai, Pondicherry Multipurpose Social Service Society, Puducherry etc. in capacity building programmes for fishing community to promote the use of PFZ advisories and ocean state forecasts in Tamil Nadu and Andhra Pradesh. In addition, with the help of PIs of INCOIS funded projects on PFZ advisory and ocean state forecast evaluations, conducted 149 workshops in fishing villages. At the end of last financial year, the available records from various dissemination modes show that about 97000 fishermen used the PFZ advisories and ocean state forecasts.

Ocean Observations: Deployed 44 Argo floats (24 Iridium and 20 Argos telemetry) in the Bay of Bengal, Arabian Sea, Equatorial and Southern Indian Ocean during 2011- 2012. Four of them were mounted with additional sensors for surface temperature and salinity (STS) and Passive Acoustic Listener (PAL) sensor. One float carried biogeochemical sensors for the measurement of chlorophyll, nitrate and dissolved oxygen in addition to the standard sensors. Wave rider buoy network was expanded with the deployment of a buoy off Thiruvananthapuram. At present, the wave rider buoy network consists of six buoys. Similarly, the AWS network also was expanded to nine through the installations on board the two ships owned by Geological Survey of India (RV Samudra Shaudhi Kama and RV Samudra Kaustubh) and one ship owned by National Institute of Oceanography (RV Sindhu Sankalp). The number of tide gauges reporting data in real time to INCOIS has increased to 26 including the 5 stations reactivated and maintained by Survey of India. The two tsunami buoys purchased from SAIC, USA reported data continuously throughout the year in real time in addition to the 3 indigenous tsunami buoys deployed and maintained by NIOT, Chennai. INCOIS provided the support to RAMA moorings by organising two cruises on board Sagar Kanya and Sagar Nidhi to service 18 moorings and deploying 2 new moorings in the Bay of Bengal and Equatorial Indian Ocean.

The analysis of data from the observing systems resulted in research papers on the variability of oxycline in the north Indian Ocean, influence of ENSO on the cyclone activity in the Bay of Bengal, analysis of anomalous cooling in the Bay of Bengal in June 2009 and in the analysis of the dynamics of weakening of spring Wyrkti Jet during 2006-2011.

Ocean modelling: The MoMp4/GODAS was made operational to provide the reanalysed sea surface temperature field over the Global Ocean to IITM, Pune to use it as the initial condition for the atmospheric model used to develop the seasonal prediction of Indian monsoon. This model provided improved SST field over the Indian Ocean due to the assimilation of additional data from the region.

Ocean Data Management: Enhanced the data archive by adding data generated by various observing systems (XBT, drifter, tide gauges, moored buoys, ship board AWS, Argo, ADCP moorings, HF radar, CTD profiles, COMAPS data, etc.). With the up-gradation of Sea Space ground station and the installation of Oceansat-2 ground station, several new products and data sets were generated and provided to users and to the team that generates PFZ advisories. The data products generated from Oceansat-2/OCM helped in generating and disseminating the PFZ advisories before 4:00 PM on same day and the data from AVHRR from NOAA-18 & 19, MODIS and Metops-2 helped in increasing the number of advisories by 17%.

New projects initiated: To understand the environmental preferences of Tuna and their migration pathways, a new project titled, 'Satellite telemetry studies on the migration patterns of Tunas in Indian Seas (SATTUNA)' was initiated in collaboration with CMFRI, FSI and CMLRE. This project intends to tag the Tunas with 'Pop-up Standard Archival Tags'. Training on tagging and trial tagging of 20 Yellowfin Tunas has already been completed. Actual tagging will commence in the next Tuna season in October 2012.

New Infrastructure: Established the ground station (with a self tracking antenna of 7.5 m diameter) to receive the Ocean Colour Monitor (OCM) data from Oceansat-2 satellite in association with NRSC/ISRO and ISAC/ISRO in June 2011. A state-of-art data processing module to receive and process the data from the ground station was also established in association with SAC/ISRO. The facility was formally inaugurated on 12 September, 2011.

As part of establishing a 'Nationwide Integrated Seismic and GPS Network', installed two 9 meter antenna INSAT hub stations at INCOIS and NCMRWF, Noida. This enables the reception of seismic and GPS data from 90 field stations in real time. Establishment of high speed MPLS links with the seismic data centres at NGRI, Hyderabad; NEIST, Jorhat; Survey of India, Dehradun; Institute of Seismological Research, Gandhi Nagar and the establishment of data centres to process and archive the seismic and GPS data at INCOIS and NCMRWF, Noida are in progress.

Computing facility and web services: Improved the connectivity through the connection of NKN network and enhancing the band widths of existing ILLS from 2 x 20 Mbps to 54 and 60 Mbps. Enhanced the hardware at tsunami warning centre by installing 20 blade servers. A new web-site on PORSEC2012 to be held in Kochi during 5-9 November 2012 was developed and launched to provide the information on conference, enable the submission of abstracts, registration of delegates, booking of accommodation, etc.

Development of communication systems for ocean observation platforms: Successfully integrated the INSAT UHF transmitter with drifting buoys and wave rider buoys. One drifting buoy was deployed in the Arabian Sea during November 2011 for test purposes. The buoys provided hourly data in real-time data compared to the 6-7 observations provided through the use of ARGOS communication system. The first wave rider buoy integrated with INSAT-UHF transmitter was deployed off Visakhapatnam on 11th November 2011.

Research Publications: 21 research papers were published in peer reviewed journals. The total Impact Factor of these papers is 24.32.

Awards and Recognitions: Five scientists (Dr. Srinivas Kumar, Shri. Satyanayana, Shri. Ch. Patanjali Kumar, Ms. M.V. Sunanda and Shri. B. Ajay Kumar received the National Geoscience Award-2010 for Disaster Management. Dr. S.S.C. Shenoi delivered the Dr. H.N. Siddiqui Memorial Lecture at the annual meeting of Indian Geophysical Union. Shri. Ch. Patanjali Kumar received the MoES Certificate of Merit for the year 2011 and Dr. Satya Prakash won the First Prize at the Annual Scientific Hindi Seminar organised by MoES, New Delhi.

Promotion of Hindi: Organised Hindi Pakhwara celebrations during September 2011 and also conducted competitions for the staff of INCOIS and their children on essay writing, power point presentations, quiz and poem recital in Hindi. Another seminar in Hindi was organised on 11 October 2011.

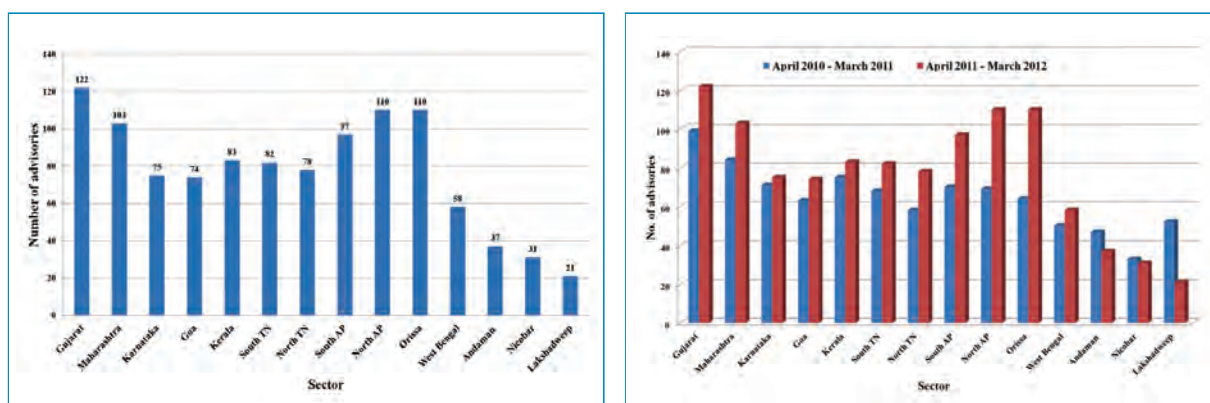
New Manpower: 9 scientists at C and B level joined INCOIS during 2011-2012.

5. Services

5.1. Potential Fishing Zone (PFZ) Advisories

During the past year, considerable progress was made on the generation and dissemination of multi-lingual PFZ advisories. The advisories, based on the satellite data on SST, chlorophyll and wind, were made available to the users thrice a week till October, 2011 and on a daily basis from November 2011. Two hundred and six PFZ advisories for 14 sectors viz. Gujarat, Maharashtra, Goa, Karnataka, Kerala, South Tamil Nadu, North Tamil Nadu, South Andhra Pradesh, North Andhra Pradesh, Odisha, West Bengal, Andaman Islands, Nicobar Islands and Lakshadweep Islands were issued.

The issue of PFZ advisories on a daily basis was done utilizing all data available for the day from NOAA-18, NOAA-19, METOP, MODIS Aqua and OceanSat-2 satellites acquired by the ground stations at INCOIS. This enabled in increasing the number of advisories issued during the last five months by 17%.



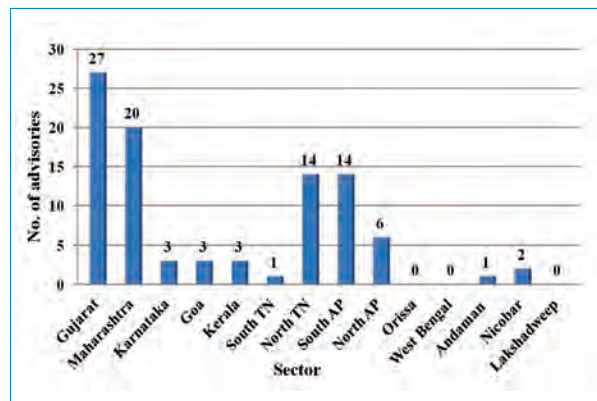
Number of PFZ advisories generated for different sectors

Validation experiments carried out off Goa showed that fish caught in the PFZ areas are more mature and healthier (condition factor, $K = 1.2$ for Indian Mackerel and 1.0 for Oil Sardine) and the Catch Per Unit Effort (CPUE) in PFZ areas increased between 2 to 10 times than the CPUE in non-notified PFZ areas. Experiments conducted off Gujarat showed that the size of the Ribbonfish caught in PFZ areas were always bigger than those found in non-notified PFZ areas. Also the quantity of Ribbon fish caught in PFZ area was double than that caught in non-notified PFZ areas.

5.2. Tuna Fishery Advisories

Forty two Tuna fishery advisories in the form of maps and text information were generated and disseminated to the registered users through emails and website thrice a week. A new project titled "Satellite Telemetry studies on the migration patterns of TUNA in Indian seas (SATTUNA)" was initiated in collaboration with CMFRI, FSI and CMLRE to study the migratory patterns and environmental preferences of Tuna. A training programme on "Tagging Tunas with Pop-up Satellite Archival Tags" was conducted to train the project staff from CMFRI, FSI and INCOIS on tagging and tag attachment procedures.

During the period November 2011 to March 2012, 20 Yellowfin Tunas (YFT) were tagged off Visakhapatnam (08), Chennai (05) and Lakshadweep Islands (07) using light weight (40 gms in air) Pop-up Standard Archival Tags (PSAT). The tag provides vital information on vertical and horizontal migration patterns, environmental preferences (like temperature) and light level. After pop-up, the positions of the tags also provide surface currents.



Number of Tuna fishing advisories generated for different sectors

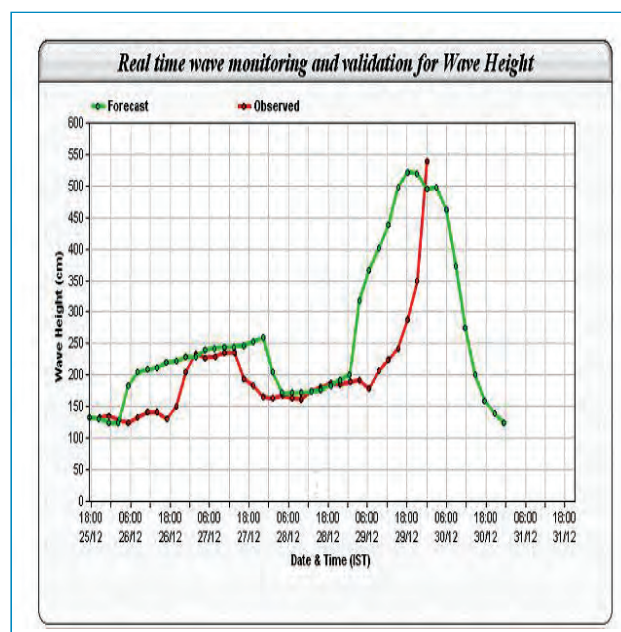
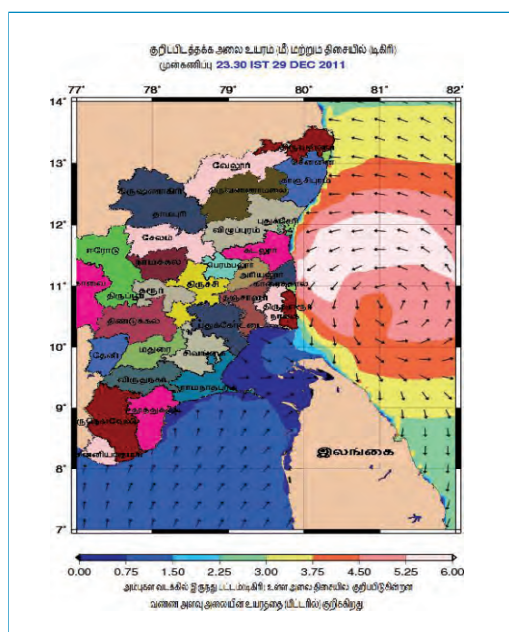


Tagging the Yellowfin Tuna

5.3. Ocean State Forecast

During last fiscal year, a regional system called "Ocean State Forecast and Fishery Information System for Kerala" was developed aiming at the coastal population of Kerala and was implemented in collaboration with Centre for Earth Science Studies (CESS), Thiruvananthapuram. This system includes the ocean wave forecasts in Malayalam, validation of wave forecasts using a wave rider buoy, and dissemination of information through webpage and Electronic Display Board (EDB) in Malayalam.

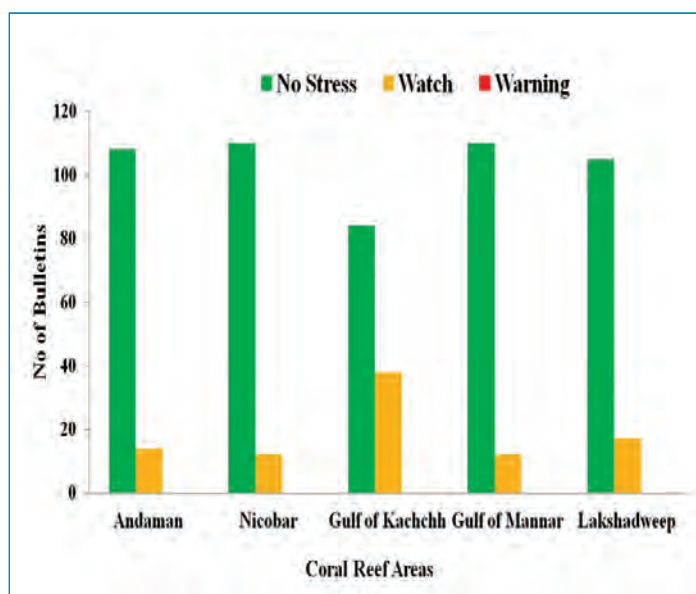
Alerts during Cyclone Thane: The 'High Wave Alerts' issued during cyclone Thane proved to be highly useful for the local population and local authorities in managing the situation. During cyclone Thane, which was active from 25 -29 December, 2011, 'High Wave Alerts' were issued to the coasts of Tamil Nadu and Southern Andhra Pradesh in local and English languages. The alerts were issued and updated every 3 hours and disseminated through INCOIS website, EDB, telephone, e-mails and fax. The wave parameters recorded by the wave rider buoy deployed off Puducherry matched well with the forecasts.



A snapshot of the web posting of wave forecasts during the cyclone Thane. Comparison of forecasted wave height and the wave height measured by the wave rider buoy deployed off Puducherry also is shown.

5.4. Coral Bleaching Alert System (CBAS)

CBAS service reports the early signs of bleaching. One hundred and twenty two bi-weekly products on Hot Spot (HS), Degree of Heating Weeks (DHW's) and HS time-series plots were generated and made available on INCOIS website (<http://www.incois.gov.in/Incois/coralwarning.jsp>). No warning of coral bleaching was issued during the period though the watches for Andaman (14), Nicobar (12), Gulf of Kachchh (38), Gulf of Mannar (12) and Lakshadweep Islands (17) were issued. No bleaching events were noticed and reported during this year.

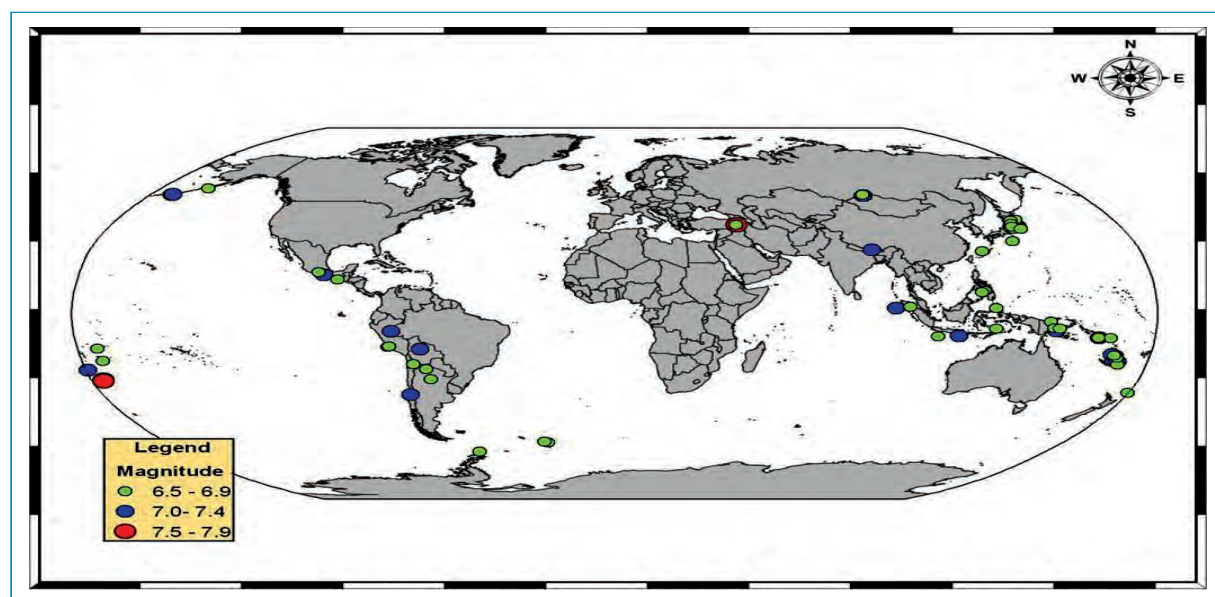


Number of coral bleaching advisories issued during 2011

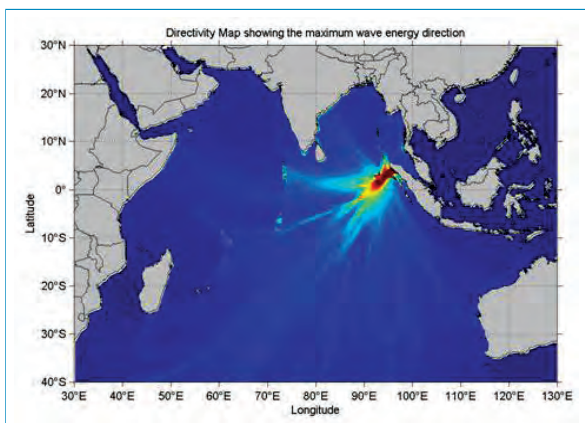
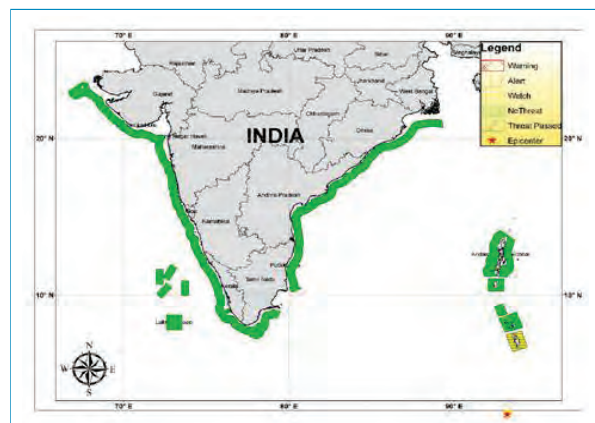
5.5. Early Warning System for Tsunami and Storm Surges

The year was an important year for the Indian Tsunami Early Warning Centre (ITEWC). Following the IOWave11 exercise on 12 October, 2011, Madam Irina Bokova, the Director-General of UNESCO, in the presence of Dr. Wendy Watson-Wright, Addl. D.G. UNESCO and Executive Secretary, IOC and Shri. Vinay Sheel Oberoi, Indian Ambassador to UNESCO formally designated ITEWC as the Regional Tsunami Advisory Service Provider (RTSP) for the Indian Ocean region. Since then, the ITEWC also issues tsunami bulletins for the Indian Ocean region in addition to issuing bulletins for India.

During April 2011 – March 2012, ITEWC detected and reported 64 earthquakes of magnitude 6.5 and above. Out of 64 earthquakes, the centre issued tsunami advisories for 5 major earthquakes occurred in the Indian Ocean. The centre issued “Tsunami watch” on one occasion for Indira Point in Andaman and Nicobar Islands for the earthquake that occurred off west coast of Northern Sumatra on 11 January, 2012 and cancelled it within 1½ hours after confirming that the sea level at the tide gauges have not changed significantly. On other four occasions, “No Threat” bulletins were issued for the Indian Ocean region.



Locations of earthquakes (magnitude > 6.5) monitored at ITEWC during April 2011 to March 2012



Directivity and threat maps of the earthquake event off west coast of Northern Sumatra (7.3M) occurred on January 10, 2012 at 00:07 (IST)

The centre, as the RTSP for Indian Ocean, issued and communicated earthquake bulletins to all major earthquake events of magnitude > 6.5 and provided RTSP Service Level – 1 (earthquake information) information to the Indian Ocean rim countries and to PTWC, JMA and IOC. Also developed RTSP Service Level – 2 (earthquake information supplemented by model outputs) service according to the recommendations of the Indian Ocean Tsunami Warning System (IOTWS) Working Group-2 and the RTSP Task Team (RTT). The RTSP Service Level-2 bulletins were generated and tested during the IOWave exercises and COMMs Tests. The performance achieved by the centre against the performance targets set by the ICG-IOTWS is listed below.

Performance indicators of ITEWC against the targets set by ICG-IOTWS

S. No	Parameter	Targets	Performance
1.	Elapse time from EQ to initial EQ info issuance (local/distant)	10/15 min	6 min
2.	Probability of detection of IO EQ with $M_w \geq 6.5$	100 %	achieved
3.	Accuracy of hypocenter location	within 30 km	8.8 km (as compared to USGS)
4.	Accuracy of hypocenter depth	within 25 km	19 km (as compared to USGS)
5.	Accuracy of earthquake M_w magnitude	0.2	0.16 (as compared to USGS)
6.	Reliability of RTWP Operations (power, computer, communications)	99.5%	achieved

Communication Test (COMMs Test)

In line with the recommendations of ICG/IOTWS WG-2 meeting held at Hyderabad during 10-11 February 2011, quarterly COMMs test were held during the year. The aim of the tests were to validate the RTSP dissemination process to National Tsunami Warning Centres (NTWCs) and national Disaster Management Offices(DMOs). Reception of the notification messages by NTWCs in the Indian Ocean region and the access to the password-protected web sites was also tested.

ITEWC participated in the COMM test conducted on 15 June 2011, 14 September 2011 and 14 December, 2011 involving IOTWS, NTWCs and national DMOs. During the tests, tsunami notifications were disseminated to NTWCs and RTSP contacts through email, fax, GTS, SMS and website. Simultaneously, ITEWC also received the notifications and messages from the other RTSPs.



ITEWC staff participating in the COMMs tests on 14 September, 2011

IOWave11 Exercise

Another major activity taken up by the ITEWC during the year was the successful conduct of mock tsunami drill named IOWave11. The IOWave11 was organized under the auspices of UNESCO's Intergovernmental Oceanographic Commission. India along with 23 Indian Ocean Nations participated in the major ocean-wide mock drill that enacted the tsunami event of 26 December, 2004. The drill was conducted for 12 hours on 12 October, 2011 from 6:30 AM to 6:30 PM (IST) simulating a 9.2 magnitude earthquake off Northern Sumatra. ITEWC generated and disseminated 15 tsunami bulletins to national and regional contacts through Fax, SMS, email, Web and GTS. The main aim behind organizing this massive drill was to build resilience against natural catastrophes by adopting a proactive, preventive approach to reduce vulnerability and enhance preparedness levels.

The outcome of the mock drill was quite positive with the enthused participation from National Disaster Management Authority (NDMA), Ministry of Home Affairs (MHA), DMOs of all coastal states/UTs, National Disaster Response Force (NDRF), Indian Coast Guard, Indian Navy and critical coastal installations (ports, power plants, etc.).



Scientist issuing bulletins on 12 October, 2011 for mock drill 'IOWave11' at ITEWC



Mock drill being conducted in Andaman & Nicobar Islands/ Army troops and relief material are being embarked at Port Blair

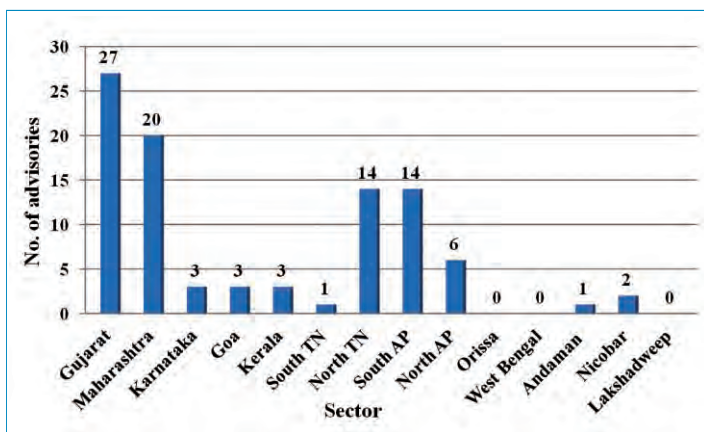
5.6. Dissemination and User Interactions

INCOIS remains committed in developing the ocean related services and making them available at the grass root levels. During the year, several new dissemination modes were introduced while continuing the previously used communication channels.

During 2011-12, INCOIS installed two EDBs at Vilinjam, Kerala and Thengaithittu, Tamil Nadu. Other dissemination modes like Information Kiosks (28 Nos.), Doordarshan, Local TV channels, FM and Community Radios, print media, EDBs (99 Nos.), emails, website and telephone / fax (97 nodes) also were used.

New dissemination modes based on mobile applications (FFMA, mKRISHI), SMS, mobile based audio advisories, IVRS and Fishermen Help-line systems (in Tamil Nadu and Andhra Pradesh) were introduced.

Further, to ensure the downstream dissemination, public address systems, notice boards, knowledge workers, NGOs, NVA Fellows of M. S. Swaminathan Research Foundation (MSSRF) and master trainers (190) were engaged. Also about 25,000 users registered directly to receive the PFZ advisories and Ocean State Forecasts through the collaborations at universities and research institutions.



Number of workshops conducted at different locations during 2011-12

In addition, 149 user awareness campaigns were conducted to create awareness of the services from INCOIS and to educate coastal population about the benefits of utilization of PFZ advisories and ocean state forecasts.



Dr. Daggubati Purandeswari, Hon'ble Union Minister of State for Human Resource Development (Higher Education) launching the "Fisher Friend Mobile Application (FFMA)" on 30 December, 2011 at Visakhapatnam

Shri. S. A. Baba, Secretary, Department of Fisheries, Government of West Bengal inaugurated a fishermen training programme cum workshop on "PFZ, Conservation and Policy of Marine Fisheries and problem of fisherman" on 2 May, 2012 at Digha Mohona, West Bengal organised in collaboration with Jadavpur University and Digha Fishermen and Fish Traders Association.



Around 1300 fishermen participated in the workshop on "PFZ, Conservation and Policy of Marine Fisheries and Problem of Fisherman" at Digha Mohona, West Bengal on 2 May, 2012

All India Radio (AIR), Karwar issued regular bulletins in Kannada on ocean state forecasts for Karwar since April, 2011.

A web site on "Ocean State Forecast and Fishery Information System for Kerala" in Malayalam was inaugurated by the Chief Minister of Kerala Shri. Oommen Chandy on 16 July, 2011 in Vizhinjam, Thiruvananthapuram. Currently, three-day forecasts on waves and winds at 16 fish landing centres along Kerala coast are being issued daily in Malayalam via this web site. Further INCOIS also disseminated ocean state forecasts at 6 locations along the coast of Kollam through Kollam Social Service Society and and Radio Benziger.



Hon'ble Chief Minister of Kerala, Shri. Oommen Chandy inaugurating Malayalam web site on "Ocean State Forecast and Fishery Information System" on 16 July, 2011 at Vazhinjam Harbour.

Information on predicted tides at few locations in Sundarbans, West Bengal as well as the ocean state forecast for the sea off Sundarbans were sent since September 2011 on a daily basis to 'Alert India', an NGO.

A web page in Tamil to disseminate the ocean state forecast, among the fishermen of Nagapattinam, Puducherry and Tiruvarur was set up on 9 December, 2011. This was very useful in disseminating the High Wave Alerts to the local population during cyclone Thane. Also, since February 2012 INCOIS disseminated ocean state forecasts at 8 stations along Northern Odisha coast through Balasore Social Service Society, Balasore, Odisha.



User Interaction workshop at Bhatkal on 15 March, 2012

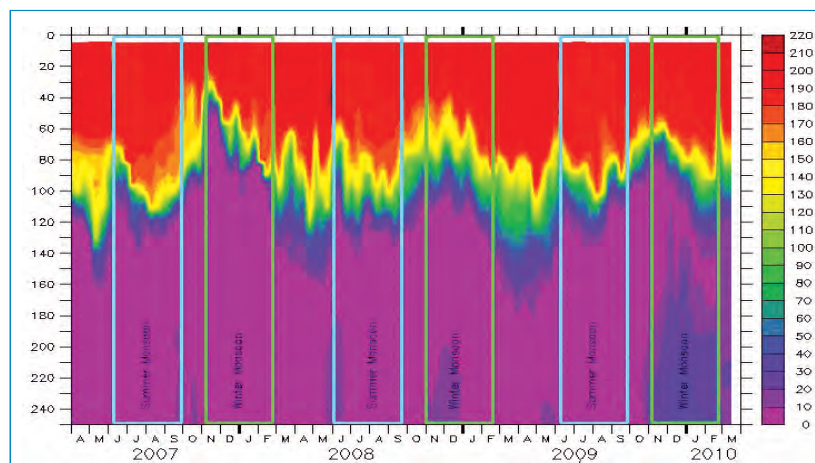
6. Ocean Observations

6.1. Indian Argo Project

The Indian Argo project continued to be the most effective means of exploring the ocean to judge the underwater environment. Forty four ARGO floats (24-Iridium and 20 Argos telemetry floats) were deployed in the BoB, Arabian Sea, equatorial Indian Ocean and southern Indian Ocean. RUDICS server for processing Iridium float was successfully set up at INCOIS so that the floats can be communicated and configured as required. Five Argo floats (3 in the BoB and 2 in the Arabian Sea) mounted with sensors for surface temperature and salinity and a Passive Acoustic Listener (PAL) sensor and one Argo float (in the Arabian Sea) with biogeochemical sensor (Chlorophyll, nitrate and dissolved oxygen) were deployed in collaboration with University of Washington. The data from Argo was used to understand the processes in the Indian Ocean.

Oxyclyne variability in the north Indian Ocean

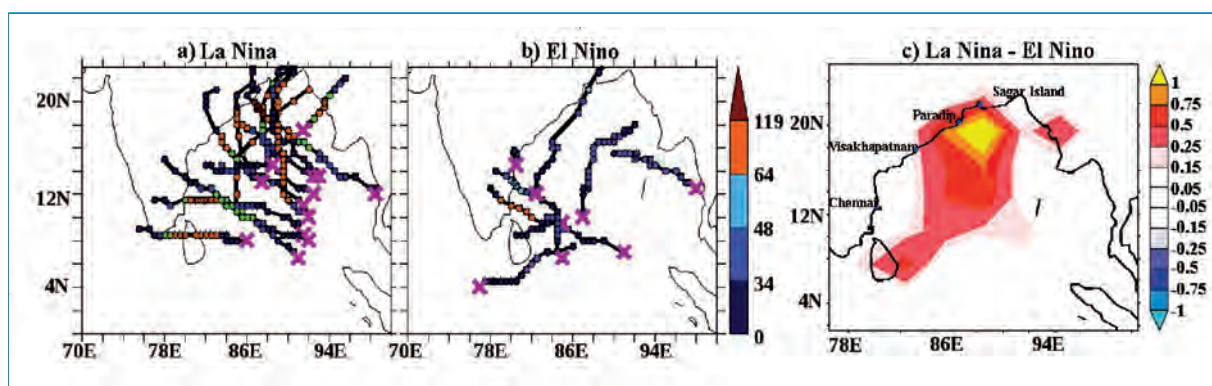
The observations and model data suggested that there is a decline in the concentration of dissolved oxygen and the oxygen minimum zones have expanded over the past 50 years in the tropical Indian Ocean. The Arabian Sea and the BoB experienced severe oxygen depletion at the subsurface layer (~ 150 - 1000 m). The dissolved oxygen data from Argo float (WMO-ID 2900776) confirmed the presence of perennial subsurface oxygen minimum zone in the central Arabian Sea with large variations and strong seasonality in oxyclyne depth. The depth of oxyclyne varied semi-annually, shoaling (~ 60 m) during November-January and deepening (~ 120 m) during April-May. The shoaling during early winter monsoon is possibly due to the westward propagating upwelling Rossby waves. This seasonality in oxyclyne was not observed during the Joint Global Ocean Flux Study (JGOFS) probably due to the limitations in analytical techniques.



Time series of dissolved oxygen (μ -mol kg⁻¹) in the upper 250 m obtained from the oxygen sensor on an Argo float (WMO ID M-mol Kg⁻¹ 2900776)

Influence of ENSO on post monsoon tropical cyclone activity in the Bay of Bengal

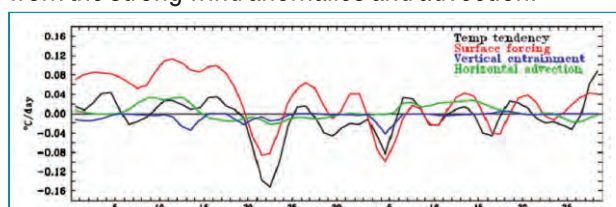
The El Niño/Southern Oscillation (ENSO) influenced the tropical cyclone activity in the BoB during the primary tropical cyclone peak season (October-December). During 1993-2010, the La Niña and negative Indian Ocean Dipole regime, the number of extreme tropical cyclone cases (wind speed > 64 kt) increased significantly in the BoB. The existence of low level cyclonic (anticyclonic) vorticity, enhanced (suppressed) convection, and high (low) tropical cyclonic heat in the BoB provided the favourable (unfavourable) conditions for the tropical cyclone activity under La Niña (El Niño) regimes together with weak vertical wind shear and high SST. The favourable location of tropical cyclone genesis shifted to the east (west) of 87°E in the BoB during La Niña (El Niño) regime due to the variability in convective activity. Under La Niña regime, convective activity and cyclonic vorticity field associated with positive phase of Madden-Julian Oscillation (MJO) amplified the background tropical cyclone conditions and lead to the enhancement of tropical cyclone formation.



Tropical cyclone activity in the BoB under (a) La Niña and (b) El Niño regime during October-December for the year 1993-2010 (color bar indicates the wind speed in knots). (c) Difference of Accumulated Cyclone Energy (104 kt²) per year in El Niño and La Niña years

Anomalous cooling in the Bay of Bengal during June 2009

Normally, during the summer monsoon season, SST over the BoB is observed to be greater than 28°C which is a pre-requisite for convection. The SST variability over the BoB has the potential to trigger deep moist convection thereby affecting the active-break cycle of the monsoons. During June 2009, satellite observations revealed an anomalous basin-wide cooling and reduced rainfall over the Indian subcontinent. The event was analyzed using both satellite and moored buoy observations. The observations showed deepened mixed layer, stronger surface currents, and enhanced heat loss at the surface in the BoB. The analysis showed that the cooling event was primarily induced by the heat losses at the surface resulting from the strong wind anomalies and advection.



◀ *Mixed layer heat budget terms at 15° N, 90° E derived from RAMA buoy observations.*

6.2. Wave Rider Buoy network

Wave rider buoy network was strengthened by adding new buoys and advanced transmission technology for faster real time acquisition of data. INCOIS successfully deployed a wave rider buoy off Thiruvananthapuram in July 2011 which transmitted data to INCOIS through HF and GSM modes.



Location of wave rider buoys



*Deployment of wave rider buoy off
Visakhapatnam*

6.3. Automatic Weather Station (AWS) Network

The AWS network was enhanced by adding new systems in co-ordination with Geological Survey of India. AWS was commissioned onboard the GSI vessels – RV Samudra Shaudhikama and RV Samudra Kaustubh in July 2011 and August 2011. AWS was also commissioned onboard RV Sindhu Sankalp a research vessel belonging to National Institute of Oceanography, CSIR, Goa during June 2011. The data obtained by these systems were transmitted to INCOIS through UHF and MSS modes of INSAT satellite in real time.



AWS onboard RV Sindhu Sankalp (Inset: close-up view of the AWS)

6.4. BoB Observatory

After the successful completion of first phase of BoB mooring, second phase of mooring was deployed successfully at 18°N, 90°E in September 2011 using ORV Sagar Kanya. Second phase of mooring is equipped with 3 doppler volume sampler current meters, 6 microcats temperature, pressure and salinity recorders and one SST sensor. The primary objective of the mooring is to understand the complex near-surface thermohaline structure in the northern BoB.

6.5. RAMA Moorings

INCOIS continued the support to RAMA moorings as per the MoU between MoES/INCOIS and NOAA/PMEL. Eighteen RAMA moorings (ATLAS, Cone Head and ADCP) were serviced during May 2011 to September 2011 onboard Sagar Nidhi (SN-53) and Sagar Kanya (SK-287 and 288) cruises covering 39 operations.



Deployments of (left) second phase of BoB mooring and (right) Iridium-ARGO float

6.6. Bottom Pressure Recorder (BPR) Network

Seven indigenous Bottom Pressure Recorders (BPR) and two SAIC BPRs (Tsunami buoys) were deployed in Bay of Bengal and Arabian Sea. The two SAIC Tsunami Buoys (STB01 in Bay of Bengal and STB02 in Arabian Sea) continuously transmitted real-time data to Indian Tsunami Early Warning Centre (ITEWC). The centre also received data from (TB05 and TB06a) deployed by NIOT in the Bay of Bengal. In addition, ITEWC also received data from 3 international buoys deployed in the Indian Ocean. The surface buoy of STB01 was maintained during ORV Sagar Kanya Cruise in May 2011 and the bottom pressure recorder (BPR) and surface buoy of STB02 was replaced during the ORV Sagar Nidhi Cruise in December, 2011.



Tsunami buoy network



Deployment of Surface buoy and bottom pressure recorder

6.7. Tide Gauge Network

Five additional tide gauges were installed by SOI during the last year. With these installations, the total number of tide gauges along the Indian coast increased to 26. INCOIS has maintained tide gauge stations with 3 sensors at 21 locations. Real time processing and analysis software was configured at INCOIS to receive, archive, process and analyze the real time data from the tide gauge network and to generate automatic notification for any significant water level changes. The centre also received continuous data from 68 international tide gauges located along the coasts of the Indian Ocean in near real-time through internet.

6.8. Integrated Seismic and GPS network of stations

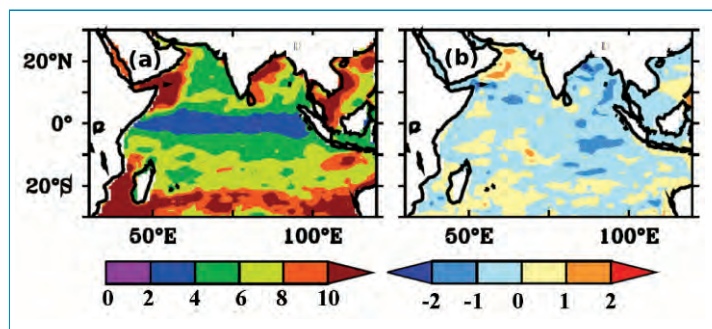
INCOIS established the integrated seismic and GPS network by connecting existing standalone seismic and GPS stations supported by MoES and DST. INCOIS also established the network to access the data from Regional Seismic Data Centres in the country through satellite and terrestrial links by setting up dedicated satellite hub stations at INCOIS, Hyderabad and IMD, New Delhi. These hubs are equipped to receive data in near real time from 170 seismic/GPS stations. Terrestrial links were established with the regional centres at IMD, NGRI, SOI, ISR and NEIST. Prototype application software and a Web Portal exclusively developed for this purpose is being used for sharing the data among the partner institutes.

7. Ocean Modelling and SATCORE

7.1. Global Ocean Data Assimilation System (GODAS)

GODAS was made operational at INCOIS in April 2011. Ocean analysis products from GODAS are being updated once a month and are being disseminated through INCOIS-LAS and FTP servers to oceanographic and meteorological communities. The products are being used as initial conditions by IITM, Pune in the coupled model for monsoon forecasts, which is the backbone of 'National Monsoon Mission' of Ministry of Earth Sciences (MoES).

Significant efforts are being made by INCOIS to assimilate in-situ salinity profiles instead of the synthetic salinity profiles in GODAS. The preliminary results showed significant improvements, particularly in salinity and sea level anomalies.

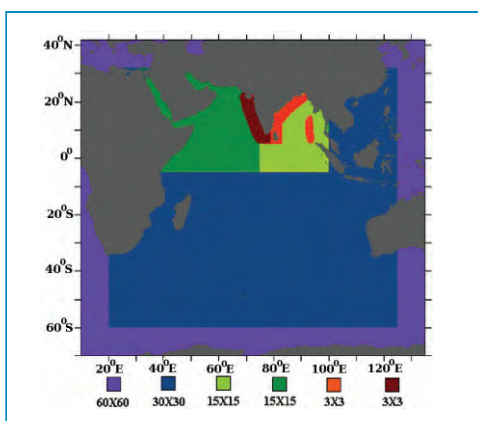


◀ (a) The RMSE (cm) of sea level anomalies obtained from GODAS simulations (temperature and synthetic salinity assimilation) and altimeter (b) The difference in RMSE (cm) in sea level anomalies simulated by GODAS (in-situ salinity assimilation) and synthetic assimilation of salinity

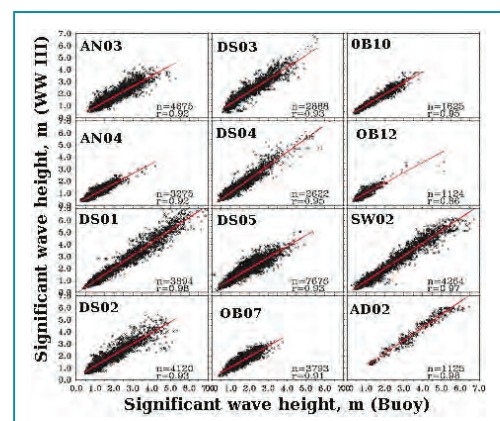
7.2. WaveWatch III

WaveWatch III was installed in single and multi grid mode on INCOIS HPC. The multi-grid model was set up for the whole globe, at a resolution of $1^\circ \times 1^\circ$ for the global ocean, $\frac{1}{2}^\circ \times \frac{1}{2}^\circ$ for Indian Ocean, $\frac{1}{4}^\circ \times \frac{1}{4}^\circ$ for Bay of Bengal and Arabian sea and $1/20^\circ \times 1/20^\circ$ for the coasts and the Andaman and Nicobar Islands. The model was tested with NCMRWF analyzed, NCEP, IFREMER/CERSAT blended and ECMWF forecasted winds.

Simulated significant wave heights (Hs) and Mean Wave directions (MWD) were validated against buoy observations in the deep water in Indian Ocean. Both Hs and MWD matched well with the observations.



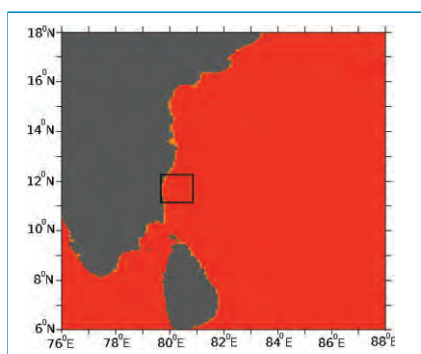
Six grids (in minutes) of the multi-grid WW III set up



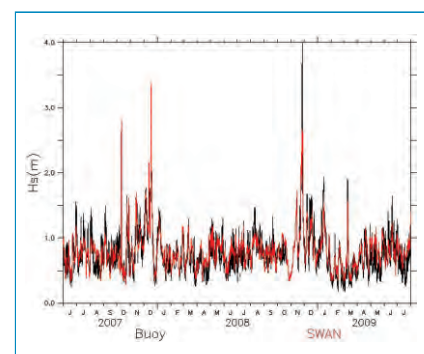
Scatter plots of significant wave height observed by buoys v/s simulated by multigrid WW III model

7.3. Simulating Waves Nearshore (SWAN)

SWAN40.85 was installed on INCOIS HPC. The model was set up around Puducherry for a domain of approximately $1.3^\circ \times 1.3^\circ$ at a spatial resolution of 250 m. The region included the INCOIS wave rider buoy at Puducherry. The model was nested with WW III. The model was tested for different wind forcings (NCMRWF analysed, ECMWF analysed, IFREMER/CERSAT blended, ECMWF forecast). Model simulated significant wave heights (Hs) were validated against the wave rider buoy observations at shallow water location off Puducherry.



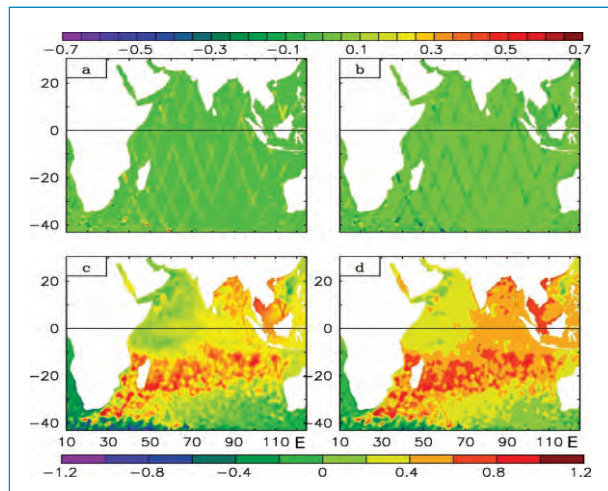
Nesting of SWAN with WW III. The red area shows the WW III grid at $1/20^\circ$ spatial resolution and the small box with thick black boundary shows the domain of SWAN



Validation of significant wave height simulated using SWAN nested in WW III at Puducherry forced with ECMWF blended winds

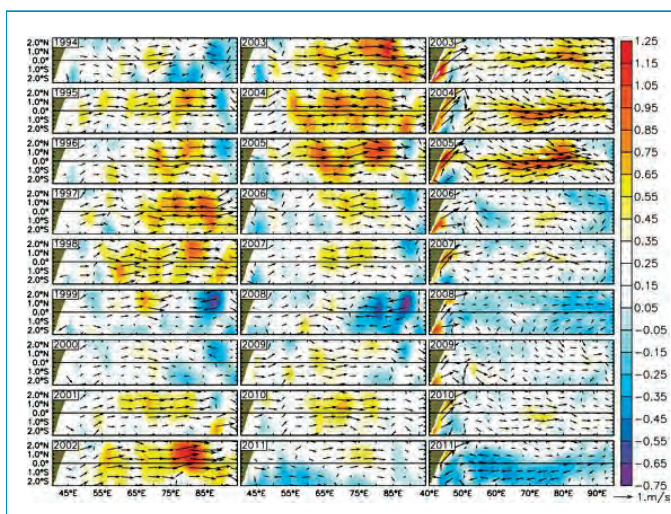
7.4. HYCOM

During the past year, the HYCOM model has been upgraded to 1/12th degree eddy resolving to meet the operational requirements. The climatological runs have been completed for 10 years. The validation of simulated parameters (SST, sea level and currents) showed improvement in capturing the finer scale oceanic features. The model is being configured with assimilation of SLA.



A sample output from experimental assimilative semi-operational system setup at INCOIS (a) along track difference between model and ingested altimeter sea-level (b) difference between merged sea-level and original model field (c) the analysis output for 16 November, 2011 (d) forecast output for 16 November, 2011

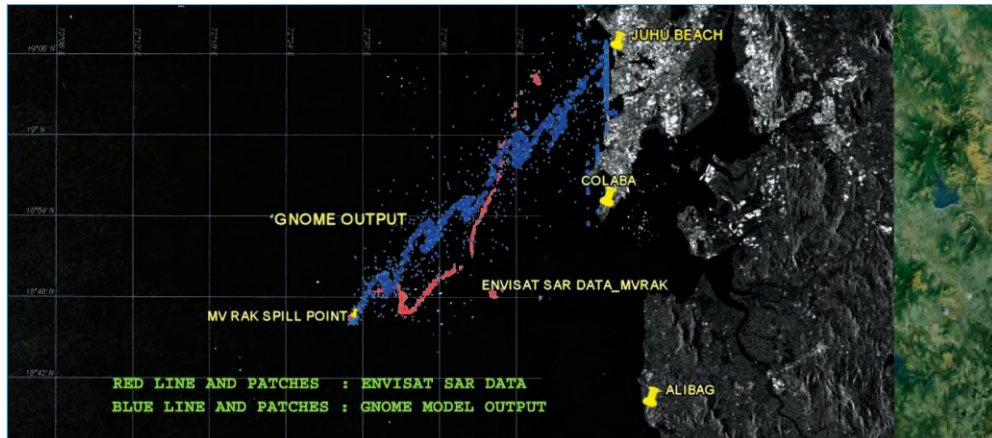
The HYCOM simulations and observations were used to understand the dynamics of spring Wyrтки Jet (WJ) in the Indian Ocean. During 2006-2011, the jet weakened and even reversed as a westward flow in 2008. The weakening coincided with uniformly high sea-level and positive east-west gradient of sea level anomalies along the equatorial Indian Ocean during the month of May. The weak jets occurred in conjunction with the latitude of zero zonal wind. During these years, the latitude of zero zonal wind moved to equator resulting in weaker than normal zonal winds along the equator. Further during 2006-2011, the normal tendency of westward propagation of the annual harmonic mode switched to eastward propagation, coherent with the wind forcing. The weak Wyrтки Jets are mainly associated with the semi-annual harmonic rather than the annual harmonic component of the zonal current. The variance explained by the semi-annual harmonic was reduced to less than half (30-40%) at the core of WJ in 2006 and later years, in comparison to the earlier years when it stood at 70-80%.



◀ *Interannual variability in spring WJs using monthly averaged current vectors for May (left and middle) from OSCAR during 1994–2011 and (right) from HYCOM during 2003–2011. The color shows the magnitude of the zonal component in ms⁻¹*

7.5. Oil spill model

GNOME model is being adjusted to predict the trajectory of oil spill and residual quantity of oil. The model is being tested with various oil spill incidents during 2009-2011. Results showed that the model performance is good in open ocean though it needs further improvements in the coastal waters.

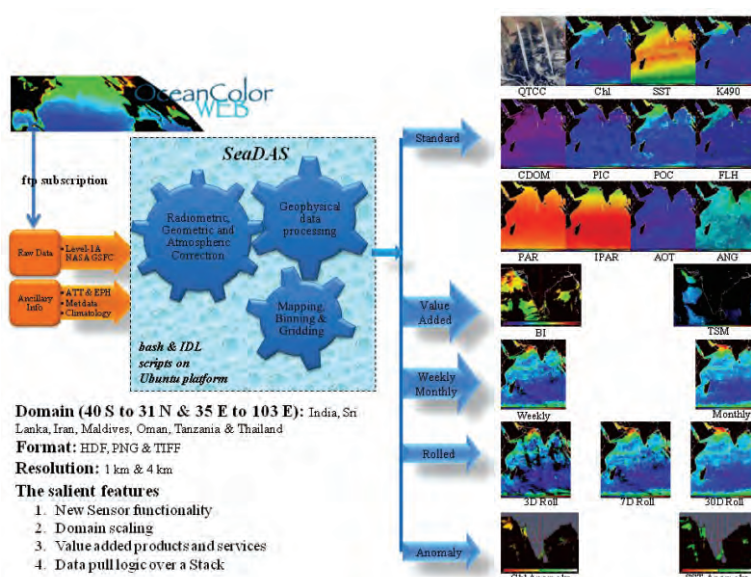


Oil spill trajectory hindcasted using GNOME model for the spill that occurred on 4 August, 2011 at 18° 46.29' N, 72° 29.19' E (off Mumbai) and the observations from ENVISAT SAR

7.6. Satellite Coastal and Oceanographic Research

Ocean Color Products

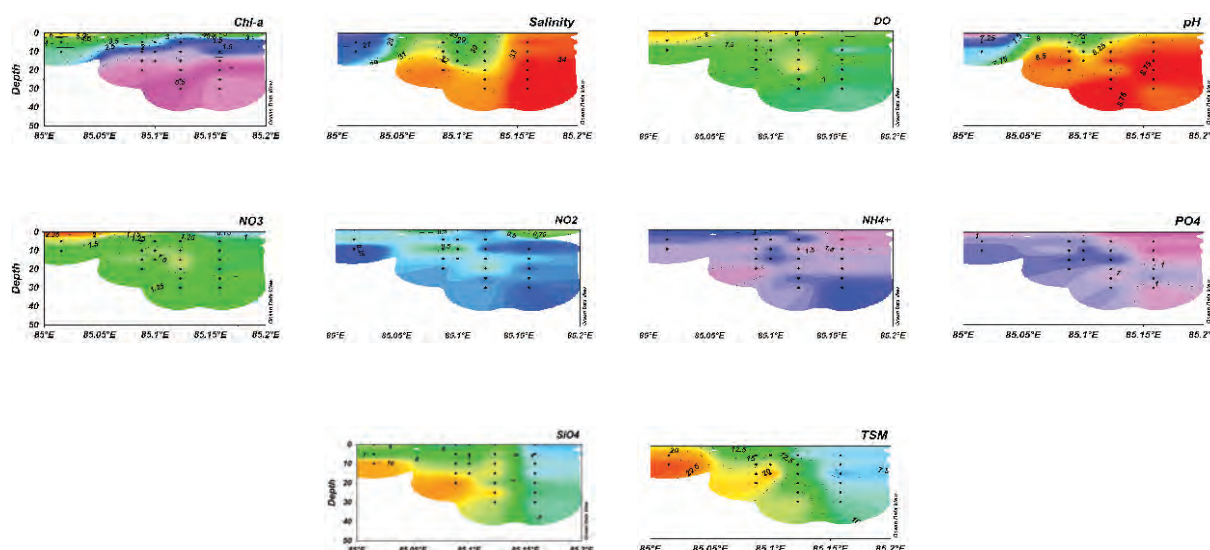
The Automatic Data Processing Chain (ADPC), setup at INCOIS, to generate and disseminate near real-time ocean colour satellite products was updated to generate the standard products on Fluorescence Line Height (FLH), Particulate Inorganic Carbon (PIC), particulate organic carbon (POC), Photosynthetic Available Radiance (PAR), instantaneous PAR (iPAR), Aerosol Optical Thickness at 865 nm (AOT865), angstrom coefficient (ANG), Total Suspended Matter (TSM), rolling chlorophyll and Sea Surface Temperature (SST) anomaly.



◀ Schematic showing Automatic Data Processing Chain (ADPC) setup at INCOIS for processing and dissemination of ocean color data products, from MODIS-Aqua, at near real-time

Analysis of in situ data

The in situ biological and physico-chemical data generated at a SATCORE time-series station off Rushikulya Estuary, Odisha was analyzed. The data set included five stations, sampled monthly, from February 2010 to January 2011, at seven depths. The physico-chemical parameters analyzed were temperature, inorganic nutrients (nitrite, nitrate, ammonium, phosphate and silicate), DO and pH. A wide spatio-temporal variability in Chl-a was observed in the area (0.11 to 10.05 mg m^{-3}) with the highest concentration during pre-monsoon season. Chl-a exhibited strong positive correlation with dissolved oxygen and negative correlation with salinity. The analysis indicated that the Rushikulya Estuary adds sufficiently well-oxygenated, nutrient-rich water to the coastal region.



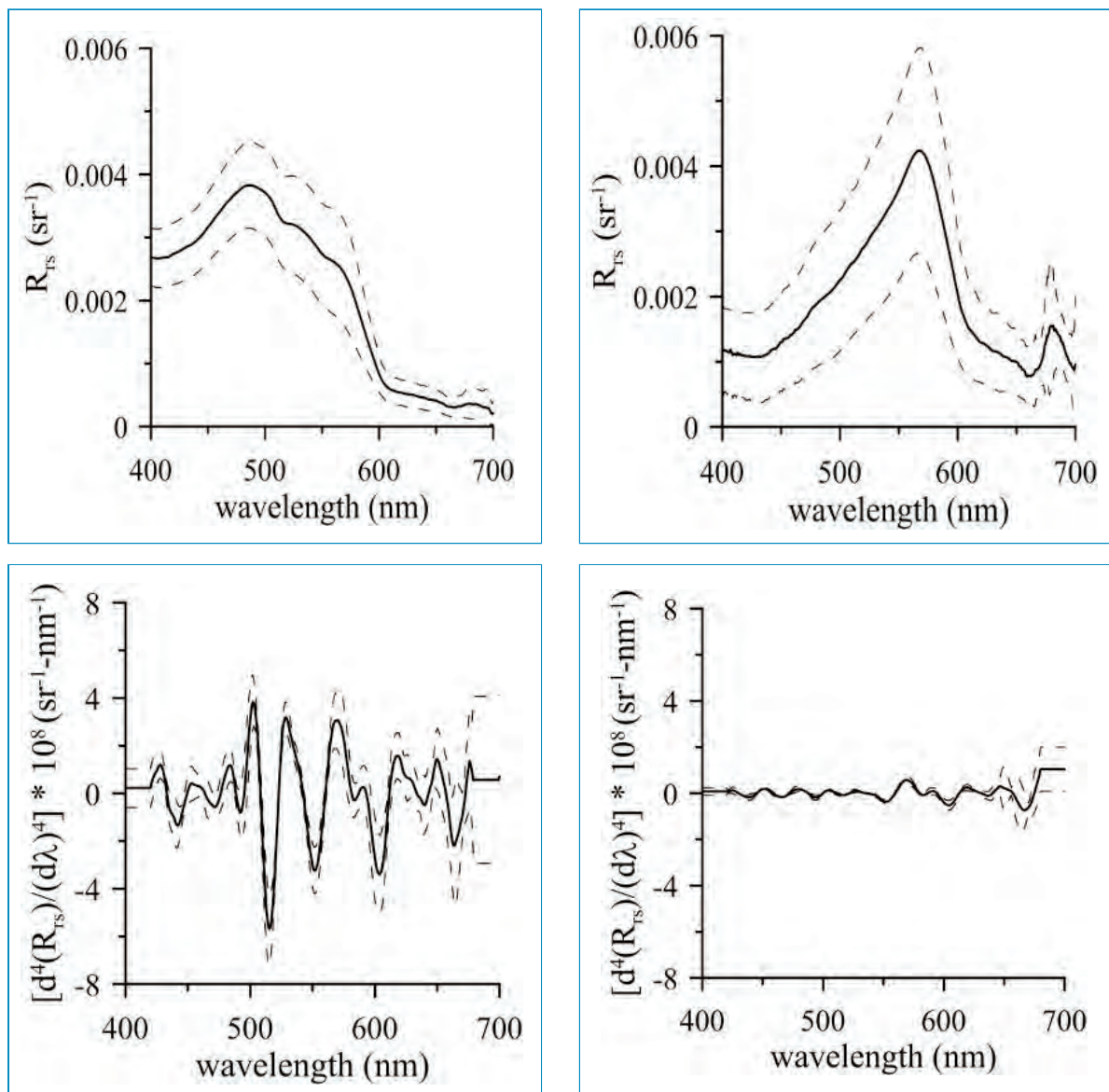
Spatial distribution of Chla and physico-chemical parameters (salinity, dissolved oxygen (DO), pH, Nitrate (NO₃⁻, Nitrite (NO₂⁻), Ammonia (NH₄⁺), Phosphate (PO₄⁻), Silicate (SiO₄⁻) and total suspended matter (TSM) along the transect off Rushikulya Estuary

Evaluation of Atmospheric Corrections schemes for case 2 waters off Kochi

Validated the chlorophyll-a (Chl-a) derived from MODIS-Aqua data using OC3M algorithm and two atmospheric correction schemes namely iterative NIR correction (atm-1) and MUMM correction (atm-2). Bio-optical data set from the field measurements from case 2 waters off Kochi were used for the analysis. The Chl-a in surface waters varied between 0.005 to 24.43 mg m^{-3} . CDOM absorption at 440 nm varied from 0.003 to 0.309 m^{-1} and TSM concentration from 0.005 to 29.95 mg l^{-1} . Atm-1 with R^2 values of 0.54 ($N=13$) proved to be better for the retrieval of Chl-a with an Absolute Percentage Difference (APD) of 25.46% and Relative Percentage Difference (RPD) of 25.46% . The APD and RPD values for atm-2 were 40.00% and 41.43% respectively. For atm-1 the RMSE was 0.49 and for atm-2 it was 0.62 .

A semi-analytical approach for band ratio-algorithm

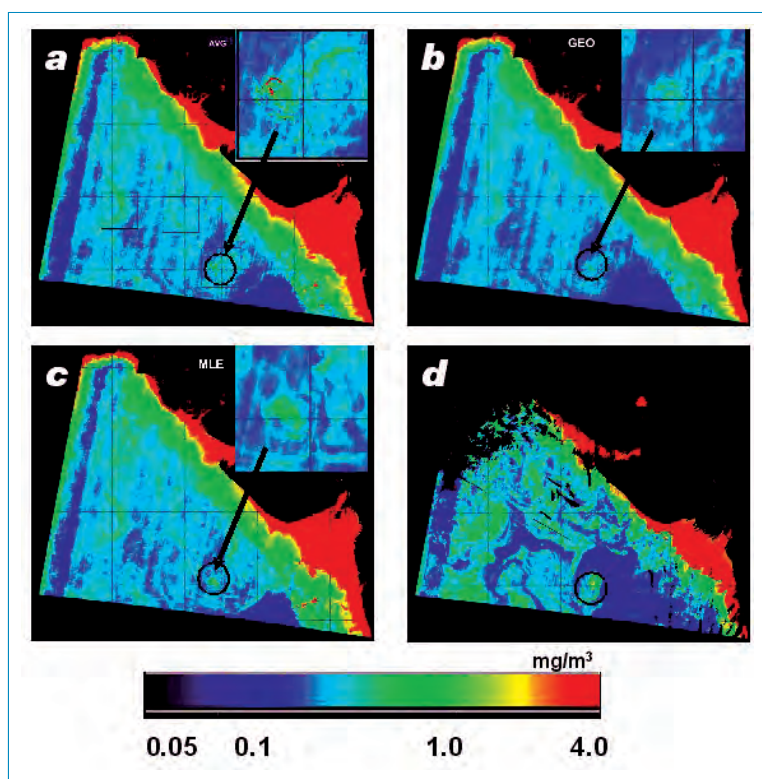
A derivative spectroscopy approach was utilized for the identification of spectral bands having optimum effect of optically active substances. The first order derivative of reflectance, with respect to wavelength, will eliminate the effect of pure water and the second order can remove the effect of suspended sediment. The even order derivatives result in the identification of bands having optimum effect of pigments. At one time-series location of SATCORE in the coastal waters of Bay of Bengal, the 2nd order derivative spectra provided qualitative identification of pigments and the 4th order derivative provided a reliable measure of photosynthetic pigment concentration. Although the reflectance data was from two different water types, the peaks were similar for both.



Mean spectral remote sensing reflectance (R_{rs}) obtained from two distinct water types (top panel). The bottom panel shows the receptive 4th order mean derivative spectra

Weekly composites of IRS-P4 OCM chlorophyll

Three averaging algorithms—arithmetic mean (AVG), geometric mean (GEO) and Maximum Likelihood Estimator (MLE) were experimented with atmospherically corrected and geo-corrected IRS P4-OCM data, to select a suitable binning algorithm to produce weekly and monthly composites of chlorophyll-a. The AVG algorithm was found to suit the best compared to the other two algorithms. The weekly composite data generated using AVG algorithm for January 2003 to April 2006 is available on INCOIS-LAS server (<http://las.incois.gov.in/>)



Monthly average of Chlorophyll-a using three averaging methods (a) AVG, (b) GEO, and (c) MLE were calculated for February 2004 and (d) for the day of 24 February, 2004

8. Ocean Data Management and Dissemination

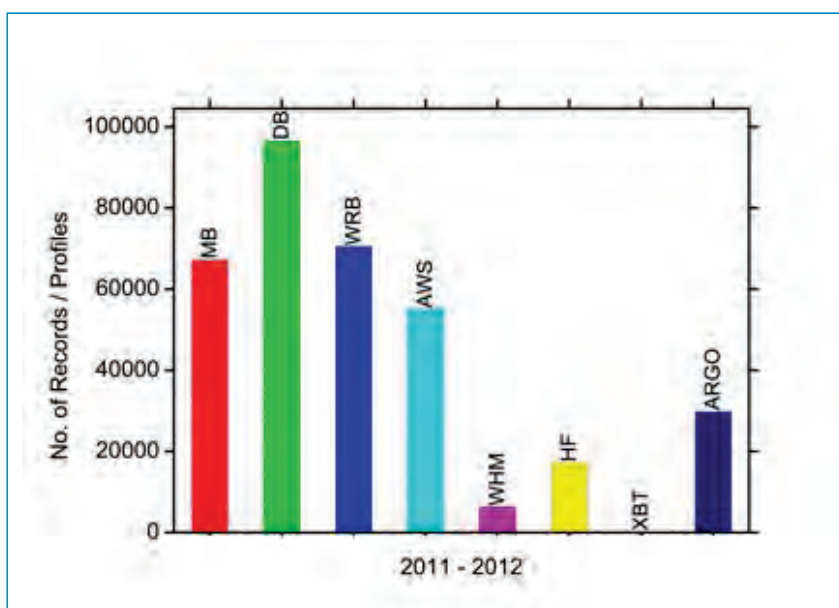
INCOIS continued to act as the central repository for the oceanographic data and information in the country. The data bank of INCOIS has been proved to be beneficial for the understanding of the complex processes and mapping the resources in the Indian Ocean. The institute also served as the National Argo Data Centre and Argo Regional Data Centre for the Indian Ocean Region.

8.1. In-situ data reception and processing

The data centre strengthened the real-time data reception, processing, quality control of surface meteorological and oceanographic data from wide variety of ocean observing systems such as Argo floats, moored buoys, drifting buoys, wave rider buoys, tide gauges, wave height meter, ship mounted autonomous weather stations and HF radars. Surface met-ocean data has been disseminated to various operational agencies in the country through email/web/ftp in near-real time. The data centre also received data from various agencies in delayed mode.

Institute / Programme	Parameters	Period of Observation	No. of Datasets / Frequency	Remarks
NIO (XBT, XCTD)	T profiles	Jan - Dec 2010	461 profiles	appended to the database
	T and S profiles	Jan - Dec 2010	138 profiles	
Sol (Sea level data)	Mean sea level	1871 - 2007	25 stations / hourly	appended to the database
INCOIS (onboard Sagar Nidhi – Wave height meter)	Wave parameters	Dec 2010 onwards	half hourly	database generated
NODPAC (Met observations along ship track)	Surface met parameters	Aug 2010 - Jun 2011	2404	archived under process
		July 2011 - March 2012		
NCAOR (CTD, XBT, SVP)	T, T and S, sound velocity profiles	2002 - 2008	100	archived under process
COMAPS	Bio-geo-phy-chem	Mar 1989 - Dec 2010	22 stations	appended to the database
ICMAM	Bio-Geo-Phy-Chem	2002 - 2007		archived
Argo	T and S	2011- 2012	29807 profiles	appended to database
ADCP	Currents	2006 - 2010		archived

Details of data archived during last year



Number of data records/profiles added to the data archive at INCOIS during 2011 – 2012

The INCOIS Live Access Server (I-LAS) was enriched with data sets from GODAS ocean analysis, MetOp SST, WHOI air-sea fluxes, ASCAT winds and Argo gridded data sets. HF Radar data was archived with download facilities in ASCII and NetCDF formats. With the availability of heterogeneous data sets, the I-LAS recorded more than 4,53,232 hits from about 30,513 unique IPs all around the world users from other countries also accessed the datasets using Open Data Access Protocol (OpenDAP).

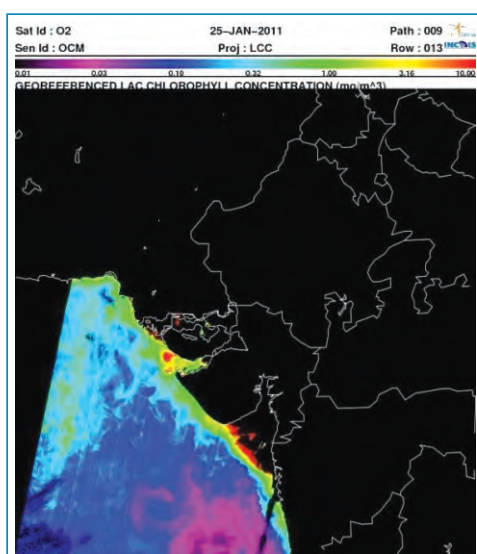
The other notable achievements of the INCOIS data center are:

- Development of software for:
 - Automatic data reception from Wave Hight Meter installed on board ORV Sagar Nidhi through INSAT communication system.
 - Visualization of MLD and SLD climatology for naval applications.
 - Identification of the closest light house on the shore to refer to the Argo floats entering within the EEZ. This service notifies NODPAC the entry of Argo float in the Indian EEZ at regular intervals.
- Released a DVD on 'Argo data and products for the Indian Ocean, version 2.0' consisting about 1,61,000 temperature and salinity profiles during 2002-2011 from the Indian Ocean.
- Extended specialized services to NODPAC, Indian Navy by setting up a secured FTP access for delivering classified data. All data sets from the Indian EEZ were disseminated using this secured access. Also provided the available data sets from South China Sea to NODPAC.

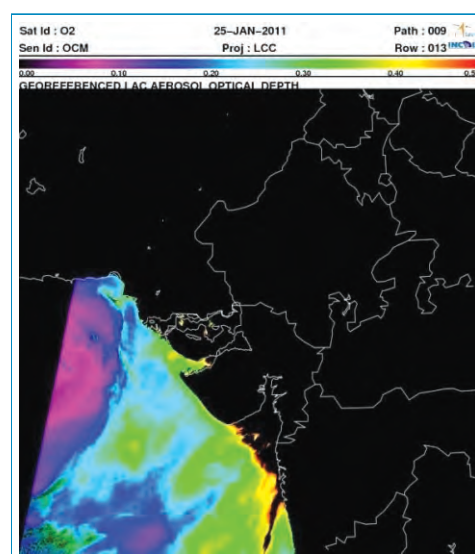
8.2. Remote sensing data acquisition and processing

The Sea Space ground station operational at INCOIS since 2005 was upgraded to receive AVHRR data from MetOp satellite. The acquisition and processing software was also upgraded to Terascan V4.0. Remote sensing data products from AVHRR and MODIS sensors viz., false colour composite (FCC), SST, Chlorophyll-a, Kd490, Calcite, Particulate Organic Carbon (POC), Chlorophyll Fluorescence Efficiency (CFE), Total Suspended Matter (TSM), Aerosol Optical Depth (AOD), fog, etc. were generated routinely and made available to the users through INCOIS website in near-real time.

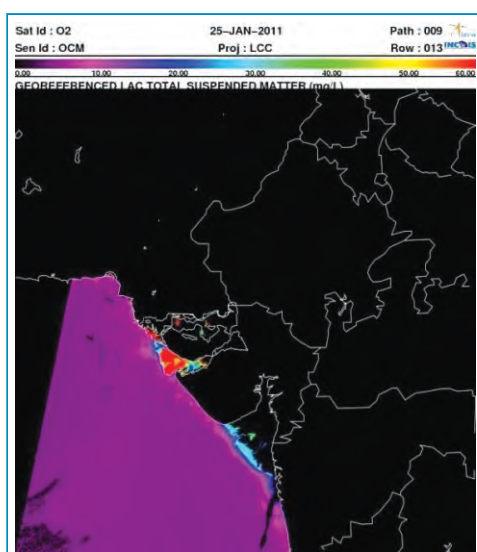
One of the important development in the past year was the establishment of state-of-the-art Oceansat-2 ground station at INCOIS campus to receive and process the data from Ocean Color Monitor onboard Oceansat-2 satellite in real-time. The ground station proved to be beneficial in improving the timelines in the generation and dissemination of PFZ advisories.



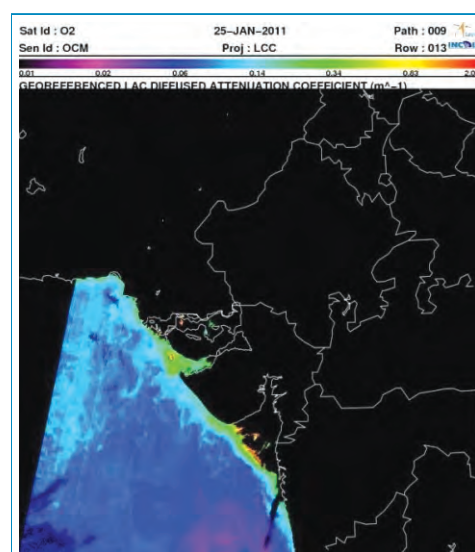
Chl-a



AOD



TSM



Kd490

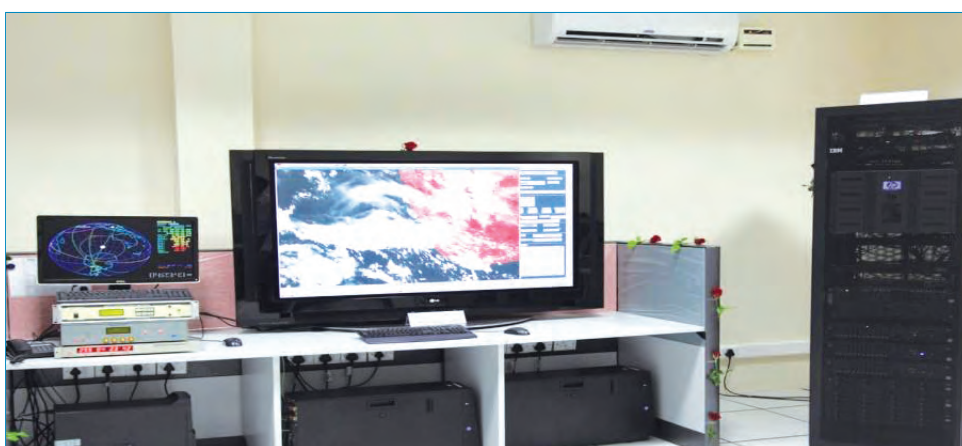
Oceansat-2 Ocean Color Monitor data products generated at INCOIS using the data received at the ground station established at INCOIS

9. Computing, Communications and Web-Based Services

For the mission critical projects taken up by INCOIS, Computational and Web-based services group provided the required computational, electrical, communicational and web based infrastructure by designing, developing, implementing the supporting hardware, software, networking, communication and electrical services.

Computing

A state-of-art data centre was designed and implemented to receive and process the data from ocean color monitor on-board Oceansat-2.



Oceansat-2 Data Centre

The computing infrastructure at Tsunami Early Warning Centre was upgraded using HP blades to install a real-time seismic data processing software (Seiscomp and Hydra) and the Decision Support System (DSS) software, and to enable the data reception and processing of national and international sea-level data (tide gauges and BPR).

To automate the business procedures and to reduce the man hours, a SAP based office automation process has been initiated. This will contain HR, purchase, stores finance and other important modules.

INCOIS will host a special data centre for OBIS (Ocean Biogeographic Information System) as a contribution of Indian Government to IOC/UNESCO.

Maintained the 7.2 TF computing facility and made available to external users from NIO, IISc, IIT-Kharagpur, IMD – Hyderabad and NESAC. The HPC facility is configured with the NKN public network which allows faster connectivity to the external users. The connectivity is further improved through the up-gradation of existing Internet Leased Line service from 2x20Mbps to 54Mbps and 60Mbps.

A new state-of-art telepresence facility was established to connect with MoES and other institutions. The facility is being widely used to have one-one/one-many meeting with ministry head quarters at New Delhi and with sister organizations NCMRWF, NCAOR, NIOT, CMLRE, IMD and IITM. The telepresence facility was used to connect with IOC and the RTSP in Indonesia and Australia during the IOWave11 exercise. The facility was also used to provide parallel classroom for the training activities at IODE, Oostende, Belgium.

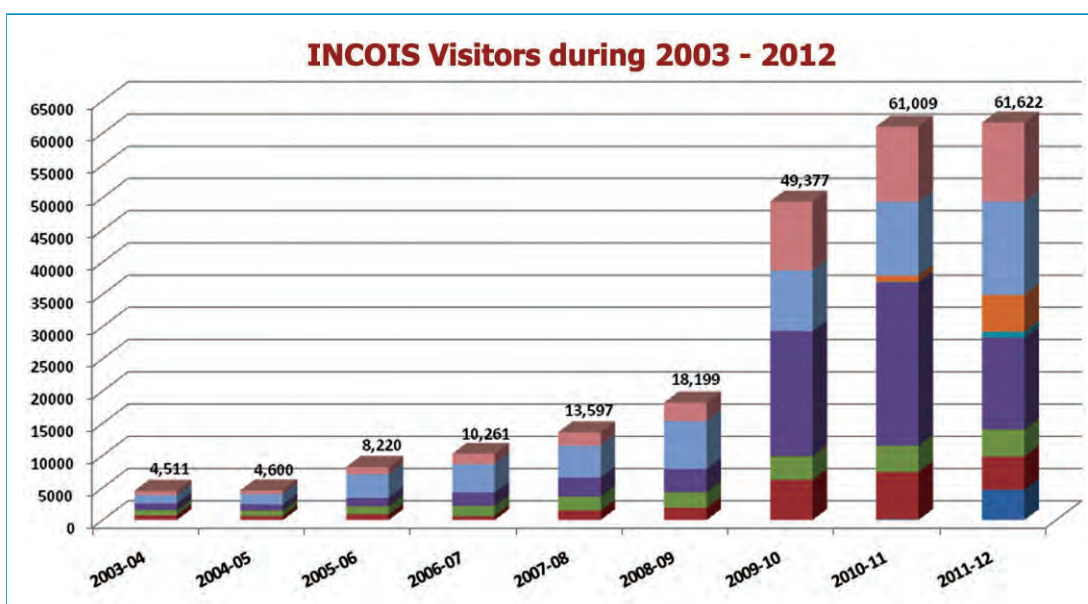
Web developments and hosting

New webpages for the online submission of job applications and its processing, PORSEC-2012 conference (proposed to be held in November, 2012 in Kochi, Kerala) were developed and launched.

The number of users accessing the INCOIS web pages increased as compared to previous years.



Pan Ocean Remote Sensing Conference (PORSEC)-2012 webpage



Number of users accessed the web pages since 2003

Communications

Nine metre INSAT hub station has been established at INCOIS, Hyderabad and NCMRWF, Noida to receive real time seismic and GPS data from 90 stations that are part of the National Integrated Seismic and GPS network. The hub stations will operate with two different INSAT satellites, each supporting half of the VSAT's.

INCOIS in association with ISRO/NRSC has successfully established the 7.5 m ground station at INCOIS in June, 2011 to receive real-time data from Oceansat-2 satellite. The ground station at INCOIS was inaugurated on 12 September, 2011 by Shri Vilasrao Deshmukh, Hon'ble Minister of Science and Technology and Earth Sciences and Shri N. Kiran Kumar Reddy, Hon'ble Chief Minister of Andhra Pradesh in the presences of Dr. K. Radhakrishnan, Secretary, DOS and Chairman ISRO and Dr. Shailesh Nayak, Secretary, MoES and Chairman, ESSO.



Inauguration of Oceansat-2 ground station at INCOIS and communication facilities at Oceansat-2 ground station

INSAT UHF transmitter was integrated with drifting buoy and wave rider buoy to support the real time reception of data. A drifting buoy equipped with INSAT was deployed in the Arabian Sea during November, 2011 in collaboration with NIO.

Wave rider buoy integrated with INSAT-UHF transmitter deployed off Vishakhapatnam, Puducherry and Port Blair are transmitting data to INCOIS continuously.

10. General Information

For the mission critical projects taken up by INCOIS, Computational and Web-based services group provided the required computational, electrical, communicational and web based infrastructure by designing, developing, implementing the supporting hardware, software, networking, communication and electrical services.

10.1. International Collaboration

10.1.1. Indian Ocean GOOS (IOGOOS)

The IOGOOS secretariat at INCOIS co-ordinated various capacity building programmes organized by INCOIS and other international institutes / associations. Bay of Bengal Large Marine Ecosystem (BOBLME) joined IOGOOS as associate member.

10.1.2. SIBER Secretariat

SIBER is a basin-scale international programme that is making a concerted effort to develop an enhanced understanding of the Indian Ocean and its role in the global biogeochemical cycle. This programme is intended to provide scientific guidance and potential research focus to many countries, including Indian Ocean rim countries, interested in pursuing research activities in the Indian Ocean. To facilitate information sharing among various international programmes and to co-ordinate the activities pertaining to SIBER in different Indian Ocean rim countries, an International Programme Office (IPO) has been established in December, 2010 at INCOIS.

During the past one year, IPO has made significant contributions to SIBER community. It provided the logistical support for convening SIBER SSC meetings concurrent with IOP-8 and IRF-2 meetings during 25-29 July, 2011 at MGM Beach Resort, Chennai. A new SIBER website (<http://www.incois.gov.in/Incois/siber/siber.jsp>) was also launched in June, 2011.



SIBER/IPO/IRF delegates during the Second SIBER – SSC annual meeting at Chennai

10.2. Meetings/Workshops/Project Work Organized by INCOIS

- One day training was conducted on “Standard Operating Procedures (SOP)” to the Officers of DMO on 19 August, 2011 at INCOIS in collaboration with National Disaster Management Authority (NDMA), New Delhi.



SOP training programme at INCOIS on 19 August, 2011

- One day sensitization workshop was conducted at Port Blair, Andaman and Nicobar Islands on 23 August, 2011 by ITEWC in collaboration with Directorate of Disaster Management Authority, Andaman and Nicobar Islands. 40 officers from different departments of Andaman and Nicobar administration, Navy, Coast Guard, BSNL, Ports, Transport, Shipping, etc. participated in the workshop.
- INCOIS organized a three weeks training programme on “The Application of Ocean Colour Remote Sensing in Primary Productivity and Ecosystem Modelling” during 05 – 26 February, 2011 at INCOIS, Hyderabad and Andhra University, Visakhapatnam in collaboration with Nippon Foundation (NF) – Partnership for Observation of the Global Oceans (POGO), Centre of Excellence in Observational Oceanography at Bermuda Institute of Ocean Sciences (BIOS), Centre for Studies on Bay of Bengal (CSBOB), Andhra University and Regional Centre, NIO, Visakhapatnam. 18 national participants and 05 international participants from Indian Ocean rim countries attended the training programme.



Dr. Trevor Platt conducting the classes at INCOIS - POGO training programme



Participants at INCOIS-POGO training programme

- To bring out the significant findings from the INCOIS sponsored projects during XI Plan period under PFZ Mission and SATCORE, a two day workshop on “Coastal Ocean Colour – A perspective for satellite applications in the Indian Context” was organized during 19-20 March, 2012 at International Centre, Goa.



Participants at the two day workshop during 19-20, March, 2012

- Twenty two students (M.Sc, M.Tech, B.Tech) from various universities did their project work at INCOIS under the supervision of INCOIS scientists during the past financial year.
- During 19-23 March, 2012 a training course through video conferencing was simultaneously organized at INCOIS and IODE. This training program was initiated by the IOC project office with a pilot project known under OceanTeacher Global Classroom. This initiative aims to establish IODE training centres in various regions of the world that can focus courses on regional and national priorities and build a global network of ocean data and information managers.



The training program being conducted by IODE through video conferencing at INCOIS

10.3. Distinguished Visitors

1. Dr. Ashwani Kumar, Hon'ble Minister of State for Earth Sciences visited INCOIS on 9 June, 2011



Dr Ashwani Kumar at INCOIS on 9 June, 2011

2. Shri. Marri Shashidhar Reddy, Hon'ble Vice Chairman, NDMA visited ITEWC on 12 October, 2011 to witness the tsunami drill and addressed the press conference on the occasion of IOWave11 exercise.

10.4. Symposia and Lectures

Many distinguished visitors delivered lectures at INCOIS

1. Prof. Ramakrishna Ramaswamy, Vice Chancellor, University of Hyderabad delivered the foundation day lecture on “The Importance of Nonlinearity in the Natural World” on 3 February, 2012



Prof. Ramakrishna Ramaswamy delivered the foundation day lecture

2. "Plankton Blooms and Sargassum" by Dr. Stephanie King and Dr. Jim Gower, Institute of Ocean Sciences, Canada on 21 February, 2012.
3. "Tropical Indian Ocean role on Climate Change over the Monsoon region" by Dr. H. Annamalai, International Pacific Research Centre (IPRC), University of Hawaii on 1 August, 2011.
4. "Ecological Prediction of Dissolved Oxygen and Striped Bass Habitat Suitability Index in the Chesapeake Bay" by Dr. Bala Krishna Prasad M., University of Maryland on 8 June, 2011.
5. "Cognitive Wireless Sensor Networks: Future Internet" by Dr. G Rama Murthy, IIIT Hyderabad on 10 May, 2011

10.5. Awards

- National Geoscience awards - 2010 for "Disaster Management" was conferred on five scientists of INCOIS by Ministry of Mines, Government of India.

The recipients of prestigious award are Dr. Tummala Srinivasa Kumar, Shri B. V. Satyanarayana, Shri Ch. Patanjali Kumar, Ms. M. V. Sunanda and Shri B. Ajay Kumar.



INCOIS team receiving National Geoscience Award - 2010 from the Hon'ble speaker of Lok Sabha, Smt. Meira Kumar

- Ch. Patanjali Kumar was awarded MoES Certificate of Merit for the year 2011 for his outstanding contributions in the field of Ocean Science and Technology during the MoES Foundation Day celebrations held at New Delhi on 27 July, 2011.



- Dr. Satya Prakash won the First Prize at the Annual Scientific Hindi Seminar organized by Ministry of Earth Sciences at New Delhi.



10.6. Promotion of Hindi

INCOIS is constantly working for the promotion and propagation of the Official Language, Hindi. In the past year, several efforts were made to promote the use of Hindi in the institute. Shri K.K.V. Chary, Senior Administrative officer, continued to work as the Chairman of the Official Language Implementation Committee.

INCOIS conducted another seminar in Hindi on 11 October, 2011. On this occasion, Dr D. D. Ozha, Sr. Scientist, Water Resource Department and Member, Joint Hindi Advisory Committee, Government of India, Jodhpur delivered a lecture in Hindi on “Application of Laser and its uses in different areas”.

As per the directives on official language policy, the annual reports, newsletters, letter heads and visiting cards were prepared bilingual. Also, the information services of the institute like the Potential Fishing Zone advisories and OSF were issued in Hindi as well as in local languages. INCOIS also participated in the 46th meeting of Town Official Language Implementation Committee held on 23 November, 2011 at National Institute of Rural Development (NIRD), Hyderabad.

Hindi Pakhwara celebrations were organized at INCOIS by the Hindi Committee during September 2011. Dr. Ravi Ranjan, Head of the Department (Hindi), University of Hyderabad, delivered a lecture on “Problem Language of India” in Hindi during the seminar on official language held at INCOIS on 26 September, 2011. Competitions in essay writing, power point presentations, quiz and poem recital in Hindi were conducted for the staff of INCOIS and their children. Prizes were distributed to the winners and participants on this occasion.

The institute also promoted the participation of the scientists in the annual Hindi seminar organized at Ministry of Earth Sciences, New Delhi. Five participants attended this seminar. Dr. Satya Prakash from INCOIS bagged the first prize for his hindi presentation on “Samudri Sampada Ki Khoj” (Exploration of Ocean Properties) at the annual seminar held during 20 and 21 December, 2011.



Hindi Pakhwara celebrations at INCOIS during September, 2011

10.7. Vigilance Activities

Dr. M. Ravichandran, Scientist 'G' and Head, MOG continued to function as the vigilance officer at INCOIS. The vigilance awareness week was observed from 31 October, 2011 to 5 November, 2011. The pledge on vigilance awareness was taken by the officers and staff of INCOIS on 31 October, 2011 at 11:00 AM. During the period April 2011- March 2012, no complaints related to vigilance were received.

10.8. Reservation Policy

INCOIS followed Government of India's reservation policy for the recruitments during 2011-12.

Groups	Number of Employees				Number of appointments made during the calendar year 2011-2012									
					By Direct Recruitment				By Promotion			By Other Methods		
	Total	SC	ST	OBC	Total	SC	ST	OBC	Total	SC	ST	Total	SC	ST
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Group A	36	02	NIL	07	09	NIL	NIL	02	03	NIL	NIL	NIL	NIL	NIL
Group B	26	03	01	07	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
TOTAL	62	05	01	14	09	NIL	NIL	02	03	NIL	NIL	NIL	NIL	NIL

10.9. Right to Information Act

Right to Information Act, 2005, is being executed at INCOIS. Information related to the institute is uploaded regularly on the website in the prescribed format under Right to Information Act. Shri E. Pattabhi Rama Rao, Head, DMG functioned as Public Information Officer and Dr. S.S.C. Shenoi, Director, INCOIS acted as First Appellate Authority. During April, 2011 to March, 2012, thirteen requests were received under the right to information act. The requested information was provided as per RTI act. No appeals were received during the period.

10.10. Results Frame Work Document

As per government of India guidelines on “Performance Monitoring and Evaluation System (PMES)” vide PMO I.D. No. 1331721/PMO/2009-Pol for government departments, an RFD document for 2011-12 was prepared and published on INCOIS website.

10.11. Deputations Abroad

S.S.C. Sheno

Director, INCOIS

To participate in the “Eighth Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS-VIII)” meeting during 3-6 May, 2011 at Melbourne, Australia.

To participate in the Intersessional Meetings of ICG/IOTWS Working Groups, RTSP Task Team and ICG/IOTWS Steering Group during 30 November, 2011 - 2 December, 2011 at Jakarta, Indonesia.

To attend 26th session of the IOC Assembly and 44th Session of the IOC executive Council held at UNESCO during 21 June 2011 - 2 July, 2011 at Paris, France.

To attend the 13th Partnership for Observation of the Global Oceans (POGO) during 9-11 January, 2012 at Honolulu, Hawaii.

M. Ravichandran

Scientist ‘C’ and Head, MOG

To attend a workshop on the role of the Bay of Bengal in the Prediction of the Indian Monsoon during 16-18 November, 2011 held at Woods Hole Oceanographic Institution (WHOI), Fallmouth, USA .

To participate in “Second In-Region Capacity Building Workshop of the WMO/IOC Data Buoy Cooperation Panel (DBCP) and Partners Capacity Building Workshop” during 2-6 May, 2011 held at Mauritius.

To attend 27th session of the Joint WMO-IOC Data Buoy Cooperation Panel and 31st meeting on the ARGOS Joint Tariff Agreement (JTA) meeting during 26 September, 2011 - 5 October, 2011 at Geneva, Switzerland.

To participate in the 13th Argo Steering Team (AST-13) meeting during 19-22 March, 2012 at IOC, Paris, France

T. Srinivasa Kumar

Scientist 'E' and Head, ASG

To participate in the “Eighth Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS-VIII)” meeting during 3-6 May, 2011 at Melbourne, Australia.

To participate in the Intersessional Meetings of ICG/IOTWS Working Groups, RTSP Task Team and ICG/IOTWS Steering Group during 30 November, 2011 – 2 December, 2011 held at Jakarta, Indonesia.

To participate in the “Regional workshop on Standard Operating Procedures for Tsunami Warning and Emergency Response” during 18-23 September, 2011 at Jakarta, Indonesia.

To attend the Task Team 3 meeting and Japan-UNESCO-UNU international symposium during 14 – 20 February, 2012 at Tokyo, Japan.

T.M. Balakrishnan Nair

Scientist 'E' and Head, ISG

To attend GODAE Ocean View / CLIVAR GSOP Technical Workshop on Observing System Evaluation and Inter-comparisons during 13-17 June, 2011 at Santa Cruz, CA, USA.

E. Pattabhi Rama Rao

Scientist 'E' and Head, DMG

To participate in the OceanSITES Data Management Team and Steering Committee meeting during 29 November, 2011–02 December, 2011 at Scripps Institution of Oceanography, San Diego, California, USA .

Sudheer Joseph

Scientist 'D', MOG

To participate in the India Brazil South Africa (IBSA) ocean workshop and discussion on projects on coastal processes identified for joint collaboration during 7-9 March, 2012 held in Brazil.

P.A. Francis

Scientist 'D', ISG

To participate in 3rd meeting of the GODAE Ocean View Science Team (GOVST) during 14-18 November, 2011 at Paris, France.

T.V.S. Udaya Bhaskar

Scientist 'D', DMG

To participate in the OBIS Technical workshop during 8-10 June, 2011 at Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada.

To participate in ADMT meeting during 14-18 November, 2011 at Seoul, Korea.

Satya Prakash

Scientist 'C', ISG

To participate in the Argo-Oxygen meeting during 25-27 May, 2011 held at Ifremer, Brest, France.

Aneesh A. Lotliker

Scientist 'C', ASG

To pursue training on "Modelling of Primary Productivity and Inherent Optical Properties" under POGO-SCOR Visiting Fellowships for 2010 during 5 March, 2011- 5 June, 2011 at Plymouth Marine Laboratory, UK.

M. Nagaraja Kumar

Scientist 'C', ASG

To attend the MTI 2012 Avian and Marine Tracking Conference during 27 – 30 March, 2012 at Columbia, Maryland, USA.

Ch. Patanjali Kumar

Scientist 'C', ASG

To attend workshop on "Tsunami Awareness and Education: Lessons Learned and How to move Forward" conducted by UNESCAP, UNESCO during 19-21 July, 2011 at Jakarta, Indonesia.

Sourav Maity

Project Scientist 'B', ASG

To participate in the meeting on "Ecosystems for Life: A Bangladesh-India Initiative" and to participate in the training on "Ecological Flow Analysis" during 3-6 August, 2011 organized by IUCN at Kathmandu, Nepal.

K. Dinesh

Scientific Assistant 'B', MOG

To attend training on testing, calibration of metocean sensors, mooring analysis etc. during 3-10 October, 2011 at NOAA/PMEL, Seattle, Washington, USA.

B Ajay Kumar

Project Scientist 'B', ASG

To participate in the "Regional workshop on Standard Operating Procedures for Tsunami Warning and Emergency Response for Indian Ocean Countries" during 19-23 September, 2011 held at the Indonesian Agency for Meteorology, Climatology and Geophysics (BMKG), Jakarta, Indonesia.

Sidhartha Sahoo

Scientific Assistant 'B'
(Librarian), ISG

To participate in the training programme "Ocean Teacher Academy Data Curation for Information Professionals and Digitization" during 26-30 September, 2011 organized by UNESCO/IOC project office for IODE, Oostende, Belgium.

10.12. Publications

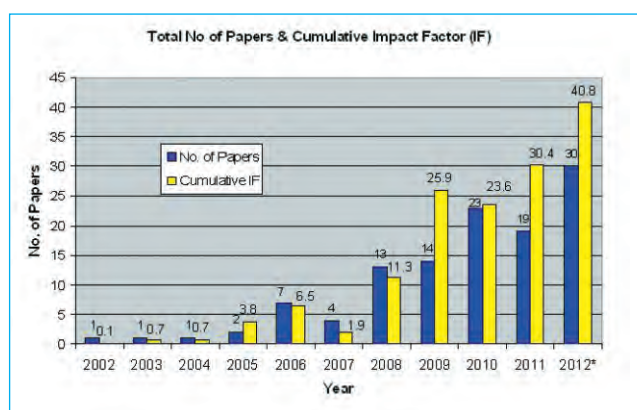
Twenty one research papers were published in peer reviewed national and international journals during the financial year 2011-2012. The total impact factor of these papers is 24.32

10.13. INCOIS publication from April, 2011 to March, 2012

1. Chopra, S., Kumar, D., Rastogi, B.K., Choudhury, P., Yadav, R.B.S. Deterministic seismic scenario for Gujarat region, India (2012) Natural Hazards, 60 (2), pp. 517-540.
2. Devi, E.U., Kumar, P., Kumar, M.R. Imaging the Indian lithosphere beneath the Eastern Himalayan region (2011) Geophysical Journal International, 187 (2), pp. 631-641.
3. Gandhi, N., Singh, A., Prakash, S., Ramesh, R., Raman, M., Sheshshayee, M.S., Shetye, S. First direct measurements of N₂ fixation during a Trichodesmium bloom in the eastern Arabian Sea (2011) Global Biogeochemical Cycles, 25 (4), art. no. Gb4014.
4. George, G., Meenakumari, B., Raman, M., Kumar, S., Vethamony, P., Babu, M.T., Verlecar, X. Remotely sensed chlorophyll: A putative trophic link for explaining variability in Indian oil sardine stocks (2012) Journal of Coastal Research, 28 (1 A), pp. 105-113.
5. Girishkumar, M.S., Ravichandran, M. The influences of ENSO on tropical cyclone activity in the Bay of Bengal during October-December (2012) Journal of Geophysical Research C: Oceans, 117 (2), art. no. C02033.
6. Girishkumar, M.S., Ravichandran, M., Pant, V. Observed chlorophyll-a bloom in the southern Bay of Bengal during winter 2006-2007 (2012) International Journal of Remote Sensing, 33 (4), pp. 1264-1275.
7. Grinson-George, Krishnan, P., Kamal-Sarma, Kirubasankar, R., Goutham-Bharathi, M.P., Kaliyamoorthy, M., Krishnamurthy, V., Srinivasa Kumar, T. Integrated potential fishing zone forecasts: A promising information and communication technology tool for promotion of green fishing in the Islands(2011) Indian Journal of Agricultural Economics, 66 (3), pp. 513-519.
8. Mahendra, R.S., Mohanty, P.C., Srinivasa Kumar, T., Shenoi, S.S.C., Nayak, .R. Coastal Multi-hazard vulnerability mapping: A case study along the coast of ellore District, East Coast of India (2011) Italian Journal of Remote Sensing, 42 (3), pp. 67-76.

9. Menon, H.B., Sangekar, N.P., Lotliker, A.A., Vethamony, P. Dynamics of chromophoric dissolved organic matter in Mandovi and Zuari estuaries - A study through in situ and satellite data (2011) ISPRS Journal of Photogrammetry and Remote Sensing, 66 (4), pp. 545-552.
10. Mujumdar, M., Salunke, K., Rao, S.A., Ravichandran, M., Goswami, B.N. Diurnal cycle induced amplification of sea surface temperature intraseasonal oscillations over the bay of Bengal in summer monsoon season (2011) IEEE Geoscience and Remote Sensing Letters, 8 (2), art. no. 5559333, pp. 206-210.
11. Neetu, S., Suresh, I., Shankar, R., Nagarajan, B., Sharma, R., Shenoi, S.S.C., Unnikrishnan, A.S., Sundar, D. Trapped waves of the 27 November 1945 Makran tsunami: Observations and numerical modeling (2011) Natural Hazards, 59 (3), pp. 1609-1618.
12. Raghavan, B.R., Nayak, S.R., Shylini, S.K., Deepthi, T., Sadatipour, S.M.T., Chauhan, P., Srinivasakumar, T., Lotliker, A., Venkat Reddy, D., Kumaraswami, M., Ashwini, S., Nisaj, M. Heterogeneous microbial oceanographic environments: Application of GIS technology in deciphering of microenvironment scenarios off the central west coast of India (2011) International Journal of Earth Sciences and Engineering, 4 (3), pp. 395-410.
13. Rao, R.R., Girishkumar, M.S., Ravichandran, M., Gopalakrishna, V.V., Thadathil, P. Do cold, low salinity waters pass through the Indo-Sri Lanka channel during winter (2011) International Journal of Remote Sensing, 32 (22), pp. 7383-7398.
14. Sahu, K.C., Baliarsingh, S.K., Srichandan, S., Lotliker, A., Kumar, T.S., (2012) Socio-economic conditions of fisher folk vis-a-vis satellite technology in coastal district of Ganjam, Odisha. 1(IV), Review of Research pp. 1-6.
15. Sahu, K.C., Baliarsingh, S.K., Srichandan, S., Lotliker, A., Kumar, T.S. Validation of PFZ advisories – A case study along Ganjam coast of Orissa, East coast of India. (2012) Indian Stream Research Journal, 1(XII), pp. 1-6.
16. Singh, A.P., Murty, T.S., Rastogi, B.K., Yadav, R.B.S. Earthquake Generated Tsunami in the Indian Ocean and Probable Vulnerability Assessment for the East Coast of India (2012) Marine Geodesy, 35 (1), pp. 49-65.
17. Singh, D., Pant, V., Kamra, A.K. The ion-aerosol interactions from the ion mobility and aerosol particle size distribution measurements on January 17 and February 18, 2005 at Maitri, Antarctica - A case study (2011) Journal of Earth System Science, 120 (4), pp. 735-754.
18. Srinivasa Kumar, T., Mahendra, R.S., Nayak, S., Radhakrishnan, K., Sahu, K.C. Identification of hot spots and well managed areas of Pichavaram mangrove using Landsat TM and Resourcesat-1 LISS IV: An example of coastal resource conservation along Tamil Nadu Coast, India (2012) Journal of Coastal Conservation, 16 (1), pp. 1-12.

19. Srinivasa Kumar, T. Nayak, S, Patanjali Kumar, Yadav, R.B.S, Kumar, A, Sunanda,M.V, Devi, E.U, Sheno, S.S.C.(2012) Performance of the tsunami forecast system for the Indian Ocean, Current Science,102(1), pp. 110-114.
20. Udaya Bhaskar, T.V.S., Swain, D., Ravichandran, M. Determination of sonic layer depth from XBT profiles and climatological salinities in the Arabian sea(2012) International Journal of Earth Sciences and Engineering, 5 (1), pp. 35-43.
21. Varikoden, H., Harikumar, R., Vishnu, R., Kumar, V.S., Sampath, S., Das, S.M., Kumar, G.M. Observational study of cloud base height and its frequency over a tropical station, Thiruvananthapuram, using a ceilometer (2011) International Journal of Remote Sensing, 32 (23), pp. 8505-8518.



*Number of research papers published during each calendar year and their cumulative Impact Factor
(*Data as on June, 2012.)*

10.14. Technical Report /Atlas

1. "GUI based interactive system for Visual quality control of Argo data" T.V.S. Udaya Bhaskar, R. Venkat Shesu, E. Pattabhi Rama Rao and R. Devender, Report No. INCOIS-DMG-TR-2012-02, March 2012.
2. "Coastal Vulnerability Atlas of India" Shailesh Nayak, T. Srinivasa Kumar, R.S. Mahendra, P.C. Mohanty, Hrusikesh Bisoyi, Report No. INCOIS-ASG-CGAM-CV-2012-01, March 2012.
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4. "INCOIS-GODAS-MOM: Ocean Analysis for the Indian Ocean: Configuration, Validation and Product Dissemination" M. Ravichandran, D. Behringer, S. Siva Reddy, M.S. Girishkumar, Neethu Chacko and R. Harikumar, Report No. INCOIS-MOG-TR-2011-06, August 2011.
5. "Regional Tsunami Advisory Services Provider (RTSP) services of Indian Tsunami Early Warning Centre" M.V. Sunanda, T. Srinivasa Kumar, B. Ajay Kumar, Ch. Patanjali Kumar, R.S. Mahendra, E. Uma Devi, M. Raghavendra, J. Padmanabham, N. Kiran Kumar and S.A. Kishore Report No. INCOIS-ASG-TR-2011-05, August 2011.
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7. "Delayed Mode Quality Control procedures for Moored Buoys in the Indian Seas" Chiranjivi Jayaram, R. Venkat Shesu, E. Pattabhi Rama Rao, T.V.S. Udaya Bhaskar and Sridevi Tiwari, Report No. INCOIS-DMG-TR-2011-03, May 2011.
8. "Argo data and products for the Indian Ocean" G. Geetha, T.V.S. Udaya Bhaskar and E. Pattabhi Rama Rao, Report No. INCOIS-DMG-TR-2011-01, March 2011.

10.15. Consultancy Projects

During the year 2011-12, INCOIS took up / completed the following projects for industrial / commercial users.

S. No	Title of the project	Client
1.	The short term changes in the landforms around the Krishnapatnam Port area in Nellore district of Andhra Pradesh - Phase-II (completed)	Krishnapatnam Port Ltd. (MapWorld Tech.), Andhra Pradesh
2.	A satellite based study for landuse/landcover Mapping, spatio-temporal changes in vegetation around TATA Chemicals Limited, Mithapur Environs, Gujarat (completed)	TATA Chemicals Ltd., Gujarat
3.	Interpretation of satellite data for the landuse/landcover classification in the parts of Paradip near the southern bank of Mahanadi Estuary, Orissa (on-going)	ESSAR Steel Orissa Ltd, Odisha
4.	Long-term shoreline change studies along the coasts of Paradeep in the Mahanadi Deltaic Environs, Orissa (on-going)	ESSAR Steel Orissa Ltd., Odisha
5.	Assessment of long term shoreline changes around the Vizhiinjam, Kerala (on-going)	L&T-Ramboll Consulting Engineers Ltd., Kerala
6.	Identification of wind potential zones in Western Offshore Field of ONGC	Institute of Oil and Gas Production Technology, ONGC, Mumbai
7.	Study of waters of Goa coast on significant wave heights up to a distance of 12 nautical miles to enable extension/fixation of GOA - IV LIMITS	Government of Goa, Captain of ports, Panaji, Goa

11. List of Acronyms

APD	:	Absolute Percentage Difference
ADCP	:	Acoustic Doppler Current Profiler
ASG	:	Advisory Services and Satellite Oceanography Group
AOD	:	Aerosol Optical Depth
AOT	:	Aerosol Optical Thickness
AIR	:	All India Radio

ADPC	:	Automatic Data Processing Chain
AWS	:	Automatic Weather Station
ATLAS	:	Autonomous Temperature Line Acquisition System
BoB	:	Bay of Bengal
BOBLME	:	Bay of Bengal Large Marine Ecosystem
BIOS	:	Bermuda Institute of Ocean Sciences
BPR	:	Bottom Pressure Recorder
CPUE	:	Catch Per Unit Effort
CMFRI	:	Central Marine Fisheries Research Institute
CMLRE	:	Central Marine Living Resources and Ecology
CESS	:	Centre for Earth Science Studies
CSBOB	:	Centre for Studies on Bay of Bengal
CFE	:	Chlorophyll Fluorescence Efficiency
CWG	:	Computational Facilities and Web based Services Group
CBAS	:	Coral Bleaching Alert System
DMG	:	Data and information Management Group
DSS	:	Decision Support System
DHW	:	Degree of Heating Weeks
DST	:	Department of Science and Technology
EDB	:	Electronic Display Board
ENVISAT	:	Environmental Satellite
ECWMF	:	European Centre for Medium range Weather Forecast
EEZ	:	Exclusive Economic Zone
XBT	:	Expendable Bathythermograph
FTP	:	File Transfer Protocol
FFMA	:	Fisher Friend Mobile Application
FLH	:	Fluorescence Line Height
GSI	:	Geological Survey of India
GODAS	:	Global Ocean Data Assimilation System

GSM	:	Global System for Mobile communications
HF	:	High Frequency
HS	:	Hot Spot
IITM	:	Indian Institute of Tropical Meteorology
INCOIS	:	Indian National Centre for Ocean Information Services
INSAT	:	Indian National Satellite
IO	:	Indian Ocean
IOGOOS	:	Indian Ocean Global Ocean Observing System
IOTWS	:	Indian Ocean Tsunami Warning and Mitigation System
ISRO	:	Indian Space Research Organization
ITEWC	:	Indian Tsunami Early Warning Centre
ISG	:	Information Services and Ocean Sciences Group
iPAR	:	instantaneous Photosynthetically Active Radiation
ICG	:	Intergovernmental Coordination Group
IPRC	:	International Pacific Research Centre
IPO	:	International Programme Office
JGOFS	:	Joint Global Ocean Flux Study
LAS	:	Live Access Server
MJO	:	Madden-Julian Oscillation
MLE	:	Maximum Likelihood Estimator
MWD	:	Mean Wave Directions
MoU	:	Memorandum of Understanding
MoES	:	Ministry of Earth Sciences
MHA	:	Ministry of Home Affairs
MLD	:	Mixed Layer Depth
MSS	:	Mobile Satellite Services
MOG	:	Modelling and Ocean Observations Group
MODIS	:	Moderate Resolution Imaging Spectroradiometer
MOM	:	Modular Ocean model
NCEP	:	National Centre for Environmental Prediction

NCMRWF	:	National Centre for Medium Range Weather Forecast
NDMA	:	National Disaster Management Authority
NDRF	:	National Disaster Response Force
NIO	:	National Institute of Oceanography
NOAA	:	National Oceanic and Atmospheric Administration
NVA	:	National Virtual Academy
NGO	:	Non Governmental Organization
OBIS	:	Ocean Biogeographic Information System
OCM	:	Ocean Colour Monitor
OSF	:	Ocean State Forecast
ODAP	:	Open Data Access Protocol
PMEL	:	Pacific Marine Environmental Laboratory
PTWC	:	Pacific Tsunami Warning Centre
PORSEC	:	Pan Ocean Remote Sensing Conference
PFZ	:	Potential Fishing Zone
PIC	:	Particulate Inorganic Carbon
POC	:	Particulate Organic Carbon
POGO	:	Partnership for Observation of the Global Oceans
PAL	:	Passive Acoustic Listener
PAR	:	Photosynthetically Active Radiation
PSAT	:	Pop-up Standard Archival Tags
RTSP	:	Regional Tsunami advisory Service Provider
RPD	:	Relative Percentage Difference
RV	:	Research Vessel
RAMA	:	Research Moored Array for African–Asian–Australian Monsoon Analysis and Prediction
RUDICS	:	Router Unrestricted Digital Information Connectivity Solution
RTT	:	RTSP Task Team
SATTUNA	:	Satellite Telemetry studies on the migration patterns of TUNAs in Indian Seas
SST	:	Sea Surface Temperature

SWAN	:	Simulating Waves Nearshore
SLD	:	Sonic Layer Depth
SAC	:	Space Applications Centre
SOP	:	Standard Operating Procedures
SOI	:	Survey of India
SIBER	:	Sustained Indian Ocean Biogeochemistry and Ecosystem Research
TSM	:	Total Suspended Matter
UNESCO	:	United Nations Educational, Scientific and Cultural Organization
UHF	:	Ultra High Frequency
VSAT	:	Very Small Aperture Terminal
WMO	:	World Meteorological Organization
WJ	:	Wyrski Jet
YFT	:	Yellowfin Tuna

12. Finance

The report of the auditors and audited accounts of INCOIS for the year 2011-2012 are placed in Appendix-1 to this report.

Appendix-1

D. SATYANARAYANA & CO.,
CHARTERED ACCOUNTANTS

D. Satyanarayana
M.Com., LL.B., F.C.A.

☎: +91 - 40 - 27616361
Mobile: +91 - 9848 444 904

1-9-639, Vidyanagar,
Hyderabad - 500 044.

E-mail: dsatyam99@yahoo.com

AUDITORS' REPORT

To
The Chairman and Members,
Governing Council,
INDIAN NATIONAL CENTRE FOR
OCEAN INFORMATION SERVICES,
Ocean Valley, Pragathinagar (BO), Nizampet (SO),
Hyderabad - 500 090.

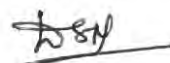
We have audited the attached Balance Sheet of the INDIAN NATIONAL CENTRE FOR OCEAN INFORMATION SERVICES as at 31st March, 2012, and also the Income and Expenditure Account and Receipts & Payments Account for the year ending on that date annexed thereto. These financial statements are the responsibility of the Society's management. Our responsibility is to express an opinion on the financial statements based on our Audit.

We conducted our audit in accordance with auditing standards generally accepted in India. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material mis-statements. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion and report that:

1. We have obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purposes of our Audit.
2. In our opinion, proper books of accounts as required by the Society, have been kept by the Society so far as appears from our examination of such books.
3. The Balance Sheet, Income and Expenditure Account and Receipts and Payments Account are in agreement with the Books of Account.
4. In our opinion and to the best of our information and according to the explanations given to us and subject to the notes forming part of accounts, the Balance Sheet as at 31st March 2012, Income and Expenditure Account and Receipts and Payments Account for the year ending on that date together with the Schedules and Notes on Accounts Annexed therewith give a true and fair view of the state of affairs of the society.

Place : Hyderabad
Date : 02-07-2012

For **D. SATYANARAYANA & CO.,**
Chartered Accountants



(D. SATYANARAYANA)

INDIAN NATIONAL CENTRE FOR OCEAN INFORMATION SERVICES

(Ministry of Earth Sciences, Govt. of India)
'Ocean Valley', Pragathi Nagar (BO), Nizampet (SO), Hyderabad - 500 090

BALANCE SHEET AS AT 31ST MARCH 2012

Particulars	Schedule	Current Year (2011 - 12) Rs.	Previous Year (2010 - 11) Rs.
<u>LIABILITIES</u>			
Corpus fund	1	9,65,51,897	9,50,16,937
Earmarked funds	2	37,55,32,547	43,43,83,992
Current liabilities and Provisions	3	3,26,88,071	2,18,40,083
Total		50,47,72,515	55,12,41,012
<u>ASSETS</u>			
Fixed Assets	4	3,65,74,981	3,76,20,210
Current Assets, Loans & Advances	5	46,81,97,534	51,36,20,802
Total		50,47,72,515	55,12,41,012
Notes forming part of Accounts	11		

As per our report of even date
For **D. SATYANARAYANA & CO.**,
Chartered Accountants

(Signature)

(D. Satyanarayana)

Place: Hyderabad
Date: 02-07-2012

(Signature)

(S. Nageswara Rao)
Accounts Officer

(Signature)

(K.K.V. Chary)
Sr Administrative Officer

(Signature)

(S.S.C. Shenoi)
Director

For and on behalf of **INDIAN NATIONAL CENTRE FOR OCEAN
INFORMATION SERVICES**

INDIAN NATIONAL CENTRE FOR OCEAN INFORMATION SERVICES

(Ministry of Earth Sciences, Govt. of India)
 'Ocean Valley', Pragathi Nagar (BO), Nizampet (SO), Hyderabad - 500 090

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH 2012

Particulars	Schedules	Current Year (2011 - 12) Rs.	Previous Year (2010 - 11) Rs.
<u>INCOME</u>			
Income from sales / Other Income	6	41,05,459	7,27,575
Interest Earned on Investments	7	71,14,156	25,38,965
Recurring Grants	8	8,17,00,000	9,54,00,000
Increase / Decrease in Inventories		1,15,891	-5,35,145
TOTAL - A		9,30,35,506	9,81,31,395
<u>EXPENDITURE</u>			
Establishment Expenditure	9	4,78,53,055	4,08,64,242
Other Administrative Expenses	10	3,80,80,218	4,31,65,584
Depreciation		56,68,673	65,04,997
TOTAL - B		9,16,01,946	9,05,34,823
Excess of Income over expenditure (A-B)		14,33,560	75,96,572
Add / Less: Prior Period Expenditure		1,01,400	26,27,682
Balance being net income / deficit transferred to Corpus Fund		15,34,960	49,68,890
Notes forming part of Accounts	11		

As per our report of even date
 For **D. SATYANARAYANA & CO.**,
 Chartered Accountants

(D. Satyanarayana)

(S. Nageswara Rao)
 Accounts Officer

(K.K.V. Chary)
 Sr Administrative Officer

(S.S.C. Shenoi)
 Director

For and on behalf of INDIAN NATIONAL CENTRE FOR OCEAN
 INFORMATION SERVICES

Place: Hyderabad
 Date: 02-07-2012

INDIAN NATIONAL CENTRE FOR OCEAN INFORMATION SERVICES

(Ministry of Earth Sciences, Govt. of India)

'Ocean Valley', Pragathi Nagar (BO), Nizampet (SO), Hyderabad - 500 090

RECEIPTS AND PAYMENTS ACCOUNT FOR THE YEAR ENDED 31ST MARCH 2012

RECEIPTS	CURRENT YEAR 2011 - 12		PAYMENTS	CURRENT YEAR 2011 - 12	
	Rs.	Rs.		Rs.	Rs.
Opening Balance			Establishment Expenses	3,81,35,377	4,22,31,073
State Bank of India, HAL CAMPUS Br.	1,11,00,256		Pay leave salary allowance	23,37,325	
Andhra Bank, Pragathi Nagar Br.	30,38,657		NPS, CPF, IDBPS	17,58,371	
INCOIS-Consultancy Services - Pragathi Nagar Br.	50,000		Staff Welfare Expenses		
Short Term Deposit with Bank	26,80,00,000	28,21,88,913			
Earmarked Funds			Administrative Expenses		
Coastal and Ocean Advisory Services	6,00,00,000		Maintenance & Repairs	89,61,575	
Tsunami & Storm Surge Warning System	6,00,00,000		Travel Expenses - Inland	14,12,887	
Computational Facilities	3,48,00,000		Travel Expenses - Foreign	15,12,957	
Research and Modeling	4,23,00,000		Travel Expenses - Others	9,17,645	
Observation Networks	5,30,00,000		Membership fee	5,07,760	
Construction of New Building (Phase II)	12,02,65,000		Vehicle Hiring	10,61,639	
IT- E Governance	12,58,000		Garden Expenses	10,65,928	
HPC Systems - Other	10,90,89,056		House Keeping Expenses	29,31,918	
V Sat Terrestrial Link	10,50,90,921		Security Expenses	48,13,944	
Multi Hazard Vulnerability	7,00,00,000	65,80,70,977	Electricity Expenditure	1,00,60,004	
Portable EDBs	22,68,000		Rent Expenses	48,180	
Recurring Grants	9,37,00,000	9,37,00,000	Water Charges	5,77,921	
Other Receipts			Postage & Telegraphs	2,20,031	
Coral Reef Project - MOP II	7,00,000		Telephone & Fax Expenditure	4,76,820	
Consultancy Projects-Sundry Debtors	38,59,003		Legal Expenses	25,000	
Earnest Money Deposits	24,14,000		Honorarium to External Experts	1,39,500	
Security Deposits	2,34,384		Conveyance Expenses	4,72,294	
Interest on Short term deposits	2,64,26,860		Bank Charges	3,194	
Interest on Bank Accounts	84,849		Printing & Stationery	2,21,685	
Interest on Vehicle Advance to Employees	10,560		Advertisement & Publicity	4,97,415	

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			e) Observation Networks Equipment 5,57,740 Software/ Hardware 5,79,372 Advance to Sub Projects 90,00,000 Advance to Purchase 2,96,70,501 Administrative Expenses 72,81,287 Margin Money 17,71,238 Data Transfer Charges 36,96,417 5,25,56,555
			f) Construction of New Building (Phase II) Architech Fee 61,41,075 Construction of Building 3,69,18,845 4,30,59,920
			g) HPC Systems - INCOIS 36,58,967
			h) HPC Systems - Other 19,55,90,344
			i) IOAS 51,25,986
			j) V Sat Terrestrial Link 5,66,94,067
			k) Multi Hazard Vulnerability 1,56,522
			l) MDC Fund 33,22,221
			m) Equipment Fund 2,76,880
			Fixed Assets Computer / Peripherals 11,550 Furniture & Fixtures 42,347 Office Equipment 1,77,934 Library 43,91,613 46,23,444
			Other Payments Security Deposits 12,08,213 Earnest Money Deposits 29,01,600 Service Tax payable 5,53,201 Phanikar Professorship 3,45,275 NF-POGO 2,66,626

For and on behalf of INDIAN NATIONAL CENTRE FOR OCEAN INFORMATION SERVICES

Place: Hyderabad
Date: 02-07-2012

INDIAN NATIONAL CENTRE FOR OCEAN INFORMATION SERVICES
(Ministry of Earth Sciences, Govt. of India)
'Ocean Valley', Pragathi Nagar (BO), Nizampet (SO), Hyderabad - 500 090

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH 2012

SCHEDULE - 1 CORPUS FUND

(Amount in Rs.)

Particulars	Current Year (2011 - 12) Rs.	Previous Year (2010 - 11) Rs.
<u>INCOME</u>		
Corpus Fund at the beginning of the year	9,50,16,937	10,16,62,183
Less: Transfer to IDBPS Trust	-	1,16,14,136
Add: Net income transferred from Income and Expenditure Account	15,34,960	49,68,890
BALANCE AS AT THE YEAR END	9,65,51,897	9,50,16,937

INDIAN NATIONAL CENTRE FOR OCEAN INFORMATION SERVICES

(Amount in Rs.)

SCHEDULE - 2 EARMARKED FUNDS

Particulars	FUND - WISE BREAK UP															TOTALS		
	Building Fund	MDC & Equipment Fund	Coastal & Ocean Advisory Services	Tsunami & Storm Surges	Computational Facilities	INDOMOD & SATCORE Projects	Observation Networks	HPC SYSTEMS- INCOIS	IT & E Governance Fund	HPC SYSTEMS - Others	MH Early Warning System	V SAT Node	Ernet India	IOAS	MH Vulnerability	Portable EDBs	Current Year 2011 - 12	Previous Year 2010 - 11
a) Opening balance of the funds	2,54,38,208	35,98,290	37,33,599	52,41,887	3,55,22,015	3,47,85,008	1,37,89,491	1,65,47,486	7,65,701	9,20,06,703	4,02,82,940	8,72,18,281	9,74,847	44,79,536	7,00,00,000	-	43,43,83,992	53,44,44,890
b) Additions to the Funds:																		
i) Grants	8,00,00,000	-	6,00,00,000	16,00,00,000	3,48,00,000	4,23,00,000	5,30,00,000	-	12,58,000	10,90,89,056		3,62,17,921	-	-	-	22,68,000	57,89,32,977	64,94,33,704
ii. Interest	72,36,183	-	16,30,704	97,202	26,89,308	10,65,087	27,35,343	10,33,034	1,41,656	37,12,798	28,19,804	44,37,039	68,430	1,94,496	49,06,101	79,599	3,28,46,784	2,63,96,235
iii. Advance for Sub Projects Utilised	-	-	1,46,27,679	61,77,716	-	4,57,82,661	3,30,03,374	-	-	-	-	-	-	-	-	-	9,95,91,430	35,94,50,469
iv) Advance for purchase utilised	-	-	1,92,68,063	4,13,897	-	-	4,31,70,306	-	-	39,49,34,126	-	-	-	-	-	-	45,77,86,392	-
v) Margin money reserved	-	-	3,07,22,000	-	-	-	3,14,32,362	-	-	-	-	-	-	-	-	-	6,21,54,362	-
vi) Mobilizations Advance reserved	62,32,688	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	62,32,688	-
TOTAL (a + b) - A	11,89,07,079	35,98,290	12,99,82,045	17,19,30,702	7,30,11,323	12,39,32,756	17,71,30,876	1,75,80,520	21,65,357	59,97,42,683	4,31,02,744	12,78,73,241	10,43,277	46,74,032	7,49,06,101	23,47,599	1,67,19,28,625	1,56,97,27,298
C) Utilisation/Expenditure																		
i) Capital Expenditure																		
W.I.P	4,81,24,534	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4,81,24,534	-
Architech fee	61,41,075	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	61,41,075	13,77,261
Equipments	-	2,76,880	2,18,48,365	1,25,85,993	33,12,143	1,35,05,450	4,59,53,570	-	-	59,05,24,470	-	5,49,97,974	-	-	-	-	74,30,04,845	25,67,89,349
Computers / Software	-	-	-	23,90,069	4,10,510	4,10,510	8,33,471	-	-	-	-	-	-	51,25,986	-	-	87,60,036	1,51,46,842
Other Assets	22,76,000	-	-	-	67,00,171	-	-	-	-	-	-	-	-	-	-	-	89,78,171	4,07,98,996
Total	5,65,43,609	2,76,880	2,18,48,365	1,49,76,062	1,00,12,314	1,39,15,960	4,67,87,041	-	-	59,05,24,470	-	5,49,97,974	-	51,25,986	-	-	81,50,08,661	31,41,12,448
ii. Revenue Expenditure																		
Technical support	-	-	-	1,26,81,401	2,37,65,476	-	-	36,58,987	-	-	-	8,48,797	-	-	-	-	4,09,54,640	1,13,80,768
Administrative expenses	-	-	2,12,08,467	3,86,44,095	45,90,503	2,76,46,922	3,62,99,372	-	-	-	-	8,37,567	-	-	1,56,522	-	12,93,83,448	18,68,61,524
Travel	-	-	29,71,607	25,70,938	9,82,492	40,05,726	29,51,220	-	-	-	-	9,729	-	-	-	-	1,34,91,714	1,95,19,811
Materials / Data	-	-	-	-	-	2,38,472	36,96,417	-	-	-	-	-	-	-	-	-	39,34,889	60,22,420
Total	-	-	2,41,80,074	5,38,96,434	2,93,38,472	3,18,91,120	4,29,47,009	36,58,967	-	-	-	16,96,093	-	-	1,56,522	-	18,77,84,691	22,37,84,523
iii. Others																		
Advances against sub projects	-	-	1,83,22,674	6,61,35,317	-	6,97,43,809	90,00,000	-	-	-	-	-	-	-	-	-	16,32,01,800	17,02,37,270
Advance for Purchase	-	-	3,45,56,771	1,08,43,388	6,59,658	1,55,849	2,96,84,509	-	-	-	-	-	-	-	-	-	7,59,00,176	32,94,32,703
Mobilization Advance	-	-	-	10,000	-	-	-	-	-	-	-	-	-	-	-	-	10,000	3,22,40,000
Transfer to IDPS Trust	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,23,00,000
Margin Money against-C	-	-	1,41,24,511	-	-	38,60,419	3,32,03,600	-	-	-	-	-	-	-	-	-	5,11,88,530	5,32,36,362
Total	-	-	6,70,03,956	7,69,88,705	6,59,658	7,37,60,077	7,18,08,109	-	-	-	-	-	-	-	-	-	29,03,00,505	59,74,46,335
TOTAL (i+ii+iii) - B	5,65,49,609	2,76,880	11,30,32,395	14,56,61,201	4,00,10,444	11,95,67,157	16,16,22,159	38,58,967	-	59,05,24,470	-	5,66,94,067	-	51,25,986	1,56,522	-	1,29,30,73,857	1,13,53,43,306
Advance Refunded -C	-	33,22,221	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33,22,221	-
NET BALANCE AS AT THE PERIOD END (A-B)	6,23,63,470	(811)	1,69,49,650	2,60,69,501	3,30,00,879	43,65,599	1,65,08,717	1,39,21,553	21,65,357	92,18,213	4,31,02,744	7,11,79,174	10,43,277	(4,51,954)	7,47,49,579	23,47,599	37,55,32,547	43,43,83,992

INDIAN NATIONAL CENTRE FOR OCEAN INFORMATION SERVICES

SCHEDULE - 3 CURRENT LIABILITIES & PROVISIONS

(Amount in Rs.)

Particulars	Current Year (2011 - 12)	Previous Year (2010 - 11)
A. CURRENT LIABILITIES		
Coral Reef Project - MOP - II	-	8,135
Project Implementation Agency	94,875	94,875
Earnest Money Deposit	18,22,700	26,40,300
Security Deposit	35,97,416	16,06,000
Performance Deposit	45,000	45,000
Outstanding Expenses	1,11,99,240	99,16,563
Sundry Creditors	13,86,957	66,713
Retention Money	12,92,682	-
Total - A	1,94,38,870	1,43,77,586
B. PROVISIONS		
Gratuity	60,17,175	37,74,986
Accumulated Leave Encashment	72,32,026	36,87,511
Total - B	1,32,49,201	74,62,497
Total (A+B)	3,26,88,071	2,18,40,083

INDIAN NATIONAL CENTRE FOR OCEAN INFORMATION SERVICES

SCHEDULE - 4 FIXED ASSETS

(Amount in. Rs)

DESCRIPTION	GROSS BLOCK			DEPRECIATION			NET BLOCK	
	As at 01.04.2011	Additions during the year	As at 31.03.2012	As at 01.04.2011	For the year 2011-12	As at 31.03.2012	As at 31.03.2012	As at 31.03.2011
1. Land	1,000	-	1,000	-	-	-	1,000	1,000
2. Plant, Machinery and Equipments	4,53,57,169	-	4,53,57,169	4,30,05,163	3,52,801	4,33,57,964	19,99,205	23,52,006
3. Furniture & Fixtures	1,49,02,938	42,347	1,49,45,285	72,86,171	7,63,077	80,49,248	68,96,037	76,16,767
4. Office Equipment	27,21,624	1,63,935	28,85,559	17,36,647	1,53,554	18,90,201	10,09,357	9,84,977
5. Computer / Peripherals	88,69,211	11,550	88,80,761	81,29,853	4,48,633	85,78,486	3,02,275	7,39,358
6. Electric Installations	10,36,688	-	10,36,688	6,58,799	37,789	6,96,588	3,40,100	3,77,889
7. Library Books	3,43,73,833	43,91,613	3,87,65,446	1,01,82,816	37,07,209	1,38,90,025	2,48,75,421	2,41,91,017
8. Other Fixed Assets	3,20,314	13,999	3,34,313	1,24,693	31,374	1,56,067	1,64,247	1,95,621
9. Vehicles	18,49,835	-	18,49,835	6,88,260	1,74,236	8,62,496	9,87,339	11,61,575
Total	10,94,32,612	46,23,444	11,40,56,056	7,18,12,402	56,68,673	7,74,81,075	3,65,74,981	3,76,20,210
Previous year	10,56,96,299	37,36,313	10,94,32,612	6,53,07,405	65,04,997	7,18,12,402	3,76,20,210	4,03,88,894

INDIAN NATIONAL CENTRE FOR OCEAN INFORMATION SERVICES

SCHEDULE - 5 CURRENT ASSETS, LOANS AND ADVANCES

(Amount in. Rs)

Particulars	Current Year (2011 - 12)	Previous Year (2010 - 11)
A. CURRENT ASSETS		
1. Inventories (Valued at cost)		8,23,897
2. Cash & Bank Balance:		
a) With Scheduled Bank - Current Account		
State bank of India HAL CAMPUS A/c	9,39,788	8,23,897
Andhra Bank Pragathinagar A/c		
Andhra Bank Pragathinagar - Consultancy A/c	3,05,63,724	1,11,00,256
b) Short Term Deposits with SBI	11,31,819	30,38,657
	2,64,147	50,000
TOTAL A:	30,58,99,478	28,30,12,810
B. LOANS, ADVANCES AND OTHER ASSETS		
1. Deposits		
a. Telephone	2,00,350	
b. Electricity	33,90,540	
c. Gas	13,100	
d. Rent	-	
e. APSTC	1,14,080	
f. Petrol/Diesel	1,01,400	
	38,19,470	27,38,210
2. Advances and other amounts recoverable in cash or in kind or for value to be received		
a. Vehicle Advance to Employees	15,64,759	11,62,057
b. Advance to NRSA (Compound wall)	2,039	2,039
c. Advance - NRSA (NDC)	38,69,949	28,39,264
d. Interest Accrued	1,58,85,162	1,10,60,980
e. Other Advances	53,81,819	17,88,396
f. Sundry Debtors	22,08,272	22,49,072
g. Tour Advance - Foreign	23,659	45,725
h. LTC Advance	12,99,720	36,000
i. Grants Receivable	10,65,00,000	19,76,38,000
j. TDS Account	1,47,90,746	1,09,08,628
k. Air India Coupons	-	1,39,621
l. Secured Advances	28,95,819	-
m. Margin Money against Bank Guarantee	40,56,642	-
TOTAL B: (1+2)	16,22,98,056	23,06,07,992
TOTAL (A+B)	46,81,97,534	51,36,20,802

INDIAN NATIONAL CENTRE FOR OCEAN INFORMATION SERVICES

SCHEDULE - 6 INCOME FROM SALES / OTHER INCOME

(Amount in Rs.)

Particulars	Current Year (2011 - 12)	Previous Year (2010 - 11)
a) Sale of Tender Forms	13,000	78,427
b) Other Receipts	40,92,459	6,49,148
TOTAL	41,05,459	7,27,575

SCHEDULE - 7 INTEREST EARNED

a) Interest on Short Term Deposits	64,18,660	23,19,389
b) Bank Account	1,23,066	1,102
c) Staff Advances	4,48,389	-
d) Others	1,24,041	2,18,474
TOTAL	71,14,156	25,38,965

SCHEDULE - 8 IRRECOVERABLE GRANTS & SUBSIDIES RECEIVED

a) Central Government (Recurring Grant received from MoES)	8,17,00,000	9,54,00,000
TOTAL	8,17,00,000	9,54,00,000

SCHEDULE - 9 ESTABLISHMENT EXPENDITURE

a) Salaries, Wages and Allowances	4,35,62,382	3,64,68,467
b) Staff Welfare Expenses	11,02,914	17,70,749
c) Contributory Provident Fund	1,62,585	7,65,243
d) New Pension Scheme	13,92,222	11,78,989
e) IDBPS Trust	7,82,518	-
f) Leave Travel Concession	8,50,434	6,80,794
TOTAL	4,78,53,055	4,08,64,242

INDIAN NATIONAL CENTRE FOR OCEAN INFORMATION SERVICES

SCHEDULE - 10 OTHER ADMINISTRATION EXPENSES

Sl. No.	Particulars	(Amount in Rs.)	
		Current Year (2011 - 12)	Previous Year (2010 - 11)
1.	Electricity and Power	92,00,654	86,66,641
2.	Water Charges including AC plant	5,77,921	5,79,590
3.	Operation and maintenance expenses	92,28,446	80,67,949
4.	Garden Expenses	10,09,161	8,33,311
5.	Rent Expenses	48,180	2,39,336
6.	Vehicle Hiring Expenses	11,13,744	18,17,532
7.	Postage, Telephone, Fax and ISDN Charges	6,87,849	6,54,000
8.	Printing & Stationary	2,21,685	7,89,226
9.	Traveling Expenses:		
	Inland	17,07,116	9,78,167
	Foreign	15,12,957	1,68,600
	Others	9,17,645	2,76,795
10.	General Expenses	5,09,961	8,00,138
11.	Auditor's Remuneration	44,944	38,605
12.	House Keeping Expenses	29,43,037	23,83,104
13.	Security Expenses	49,24,717	40,67,113
14.	Advertisement and Publicity	4,97,415	6,91,646
15.	Membership / Registration fees	5,07,760	2,98,700
16.	Legal Expenses	25,000	60,000
17.	Papers & Periodicals	19,06,136	32,67,437
18.	Conveyance Expenses	3,53,196	1,65,493
19.	Others	1,42,694	83,11,201
	TOTAL	3,80,80,218	4,31,65,584

SCHEDULE - 11

NOTES FORMING PART OF ACCOUNTS:

1. Significant Accounting Policies

a) Basis of Accounting:

The Society follows the mercantile system of Accounting and recognizes Income and Expenditure on accrual basis. The accounts were prepared on the basis as a going concern.

b) Income Recognition:

The Grant-in-aid was received by the Society from Ministry of Earth Sciences in the form of recurring and non-recurring nature, for the purposes of funding to the various projects and sub projects as specified in Schedule - 2 and for maintenance of INCOIS as shown in Schedule - 8.

During the year 2011-12, the Society received Rs. 8.17 Crores towards the maintenance of INCOIS and Rs. 57.89 Crores for the purpose of various projects and sub projects, aggregating to a total Grant-in-aid of Rs. 66.06 Crores.

c) Fixed Assets and Depreciation:

- Fixed Assets register was maintained by the Society.
- The management verified the assets physically by appointing a sub-committee.
- The additions to the fixed assets during the period of audit were stated at cost.
- Depreciation on Fixed Assets was provided on written down value, on pro-rata basis, as per the rates prescribed under the Income Tax Rules.

d) Inventories:

Inventory of stores, stationery items and other material of significant value are valued at cost.

e) Building:

As per the guidelines provided to the Central Autonomous Bodies, the Funds inflow and outflow relating to the building are initially to be shown under Building Fund in the Earmarked Funds under schedule-2. On completion of the building, the value of building is transferred to the Fixed asset schedule, as per the guidelines provided.

During the year 2011-12, the Society received funds for the extension of the building. Since, the building work is in progress during the year 2011-12, the management had decided to continue the Building Fund in the Earmarked Fund under Schedule - 2.

f) Employee Benefits:

i) Gratuity :

The present value of the INCOIS obligations under Gratuity is recognized on the basis of an actuarial valuation made by LIC of India Ltd., as at the year end.

ii) Pension:

The IDBS (INCOIS Defined Benefit Pension Scheme) is managed by a separate trust and employees contributions for the year 2011-12, towards pension for the employees joined prior to 01-01-2004, was transferred from INCOIS to IDBPS Trust. The present value of the INCOIS obligations under Pension as at the year end, is recognized on the basis of an actuarial valuation made by LIC of India Ltd.

iii) Leave Encashment:

The present value of the INCOIS obligations under Leave encashment is recognized on the basis of an actuarial valuation made by LIC of India Ltd., as at the year end.

iv) Periodical contributions made towards Contributory Provident Funds (CPF). New Pension Scheme (NPS) and IDBPS scheme (INCOIS Defined Benefit Pension Scheme) are charged to revenue.

g) Interest on Deposits:

The Society invested surplus funds from time to time in Short Term Deposit in a Nationalized Bank. For the year 2011-12, an amount of Rs.342.16 lakhs was earned as interest on the Short Term Deposits in the bank. Since, the interest received on Short Term Deposits, relate to the grants accruing to the various projects and recurring grants received by INCOIS, the management in the year 2011-12 had decided to spread the interest on Short Term Deposits to such various projects and INCOIS. Accordingly, out of total interest of Rs.342.16 lakhs, the management had transferred an interest of Rs.277.97 lakhs to various projects classified in Earmarked Funds under Schedule-2, and the balance interest of Rs.64.19 lakhs was considered as income of the Society under Schedule-7.

h) Electricity and Water Expenses:

The management had apportioned 50% of the total electricity and water expenditure Tsunami Projects and INCOIS respectively.

2. Notes on Accounts**a) Earmarked Funds:**

The Society during the year 2011-12, received Rs. 57.89 Crores as Grant-in-aid towards Earmarked Funds from The Ministry of Earth Sciences (MoES) and other institutions in the form of Recurring and Non-Recurring grants as specified under Schedule - 2.

The amounts advanced to various Earmarked Funds under Schedule - 2, shall initially be shown as 'advance to sub-projects' under "Others" category in the Earmarked Funds Schedule, and, on receipt of Utilisation Certificates from the respective project heads, the utilised amounts are transferred to either Capital expenditure or Revenue expenditure based on the nature of utilisation.

The INCOIS is making payments for the acquisition of equipment for the various projects classified under Earmarked Funds of Schedule-2. These Payments are initially shown as 'advance for purchase' under Schedule-2, and later, on completion of erecting of the equipment, the total value of equipment is transferred to equipments under the same Schedule.

The total value of 'advance for purchase' as on 31-03-2012 was Rs.17.98 Crores.

The accumulated value of the capital expenditure as on 31-03-2012 (excluding advances to sub-projects and advances for purchases), incurred in each year and specified in the Earmarked Funds under Schedule -2, are stated below:

Sl.No.	Name of the Fund / Project	As on 01-04-2011 (Rs.)	Additions 2011-12 (Rs.)	Total Amount As on 31-03-2012 (Rs.)
i)	Building Fund	21,04,53,379	5,64,43,609	26,69,96,988
ii)	MDC & Equipment Fund	6,56,44,738	2,76,880	6,59,21,618
iii)	Coastal & Ocean Advisory Services	13,37,87,827	2,18,48,365	15,56,36,192
iv)	Tsunami & Storm Surges	74,13,52,425	1,49,76,062	75,63,28,487
v)	Computational Facilities	11,28,01,318	1,00,12,314	12,28,13,632
vi)	INDOMOD & SATCORE Projects	33,39,41,519	1,39,15,960	34,78,57,479
vii)	Observation Networks	21,08,61,089	4,67,87,041	25,76,48,130
viii)	HPC System - INCOIS	13,65,14,440	-	13,65,14,440
ix)	IT & e - Governance Fund	5,76,21,080	-	5,76,21,080
x)	HPC Systems - Others	74,56,32,926	59,05,24,470	133,61,57,396
xi)	VSAT Node	73,92,913	5,49,97,974	6,23,90,887
xii)	Ernet India	72,00,000	-	72,00,000
xiii)	IOAS	-	51,25,986	51,25,986
	Total	276,32,03,654	81,50,08,661	357,82,12,315

b) Projects and Utilisation Certificates:

The committees consisting the heads of respective projects and other technical persons are monitoring the status of the various projects, including the financial budgets etc., and noting the minutes of the output of such meetings.

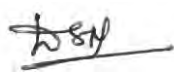
The various assets of the projects and sub-projects, purchased either by the INCOIS or respective projects and sub-projects, are located at such projects and sub projects. The confirmations of the assets held by them are yet to be received.

The respective project heads send the utilisation certificates for the year ending 31st March of each financial year and these certificates are received by the INCOIS during the subsequent financial year. Hence, the management had decided to pass the entries relating to the Utilisation Certificates actually received upto 31st March of each financial year.

- c) i) Contingent liabilities not provided for : NIL
- ii) Estimated Amount of Contracts remaining to be executed on capital account-NIL
- iii) Claims against the company not acknowledged as debts-NIL
- iv) The society had placed an order with M/s. Victory Genset Pvt. Ltd for Pvt. Ltd for purchase of two 600 KVA DG sets in the year 2009 and released 90% payment by irrecoverable LC, as per terms agreed. But, M/s. Victory Genset Pvt. Ltd had supplied only one DG set. The society claims that the documents were fabricated by supplier and hence, filed a Criminal and Civil suit in 2009 against the supplier. The III Additional Chief Judge of City Civil Court, Hyderabad, had passed a decree for the recovery of claim for breach of contract vide their order OS No.69 of 2010, dated 18-04-12.
- d) Figures of the previous year were regrouped where-ever necessary.
- e) Paise has been rounded off to the nearest rupee.

As per our report of even date
For **D. SATYANARAYANA & CO.,**
Chartered Accountants

**For and on behalf of INDIAN NATIONAL CENTRE FOR OCEAN
INFORMATION SERVICES**



(D. Satyanarayana)



(S. Nageswara Rao)
Accounts Officer



(K.K.V. Chary)
Sr Administrative Officer



(S.S.C. Sheno)
Director

Place: Hyderabad
Date: 02-07-2012





Indian National Centre for Ocean Information Services

(An Autonomous Body under the Ministry of Earth Sciences, Government of India)

'Ocean Valley', Hyderabad - 500 090, India.

E-mail: director@incois.gov.in | URL: www.incois.gov.in